Federal Aviation Administration
Aviation Rulemaking Advisory Committee

Transport Airplane and Engine Issue Area
Airworthiness Assurance Working Group

Task 6 – Widespread Fatigue Damage

Task Assignment

its Executive Committee Meeting on Thursday, January 27, 2000, at 9:30 a.m. in Conference Room 1107, Department of State Building, 2201 C Street, NW, Washington, DC. The meeting is open to the public.

The Overseas Schools Advisory Council works closely with the U.S. business community in improving those American-sponsored schools overseas, which are assisted by the Department of State and which are attended by dependents of U.S. Government families and children of employees of U.S. corporations and foundations abroad.

This meeting will deal with issues related to the work and the support provided by the Overseas Schools Advisory Council to the American-sponsored overseas schools.

Members of the general public may attend the meeting and join in the discussion, subject to the instructions of the Chair. Admittance of public members will be limited to the seating available. Access to the State Department is controlled, and individual building passes are required for each attendee. Persons who plan to attend should so advise the office of Dr. Keith D. Miller, Department of State, Office of Overseas Schools, Room H328, SA–1, Washington, DC 20522–0132, telephone 202–261–8200, prior to January 17, 2000. Visitors will be asked to provide their date of birth and Social Security number at the time they register their intention to attend and must carry a valid photo ID with them to the meeting. All attendees must use the C Street entrance to the building.

Dated: December 6, 1999.

Keith D. Miller,

Executive Secretary, Overseas Schools Advisory Council.

[FR Doc. 99–32498 Filed 12–14–99; 8:45 am]

BILLING CODE 4710–24–P

OFFICE OF THE UNITED STATES TRADE REPRESENTATIVE

Notice of Meeting of the Industry Sector Advisory Committee on Small and Minority Business (ISAC–14)

AGENCY: Office of the United States Trade Representative.

ACTION: Notice of meeting.

SUMMARY: The Industry Sector Advisory Committee on Small and Minority Business (ISAC–14) will hold a meeting on December 13, 1999, from 9:15 a.m. to 2:45 p.m. The meeting will be open to the public from 9:15 a.m. to 12:30 p.m. and closed to the public from 12:30 p.m. to 2:45 p.m.

DATES: The meeting is scheduled for December 13, 1999, unless otherwise notified.

ADDRESS: The meeting will be held at the Department of Commerce, Room 4830, located at 14th Street and Constitution Avenue, NW., Washington, DC, unless otherwise notified.

FOR FURTHER INFORMATION CONTACT: Millie Sjoberg or Cory Churches, Department of Commerce, 14th Street and Constitution Avenue, NW., Washington, DC, 20230, (202) 482–4792 or Ladan Manteghi, Office of the United States Trade Representative, 1724 F St. NW., Washington, DC 20508, (202) 395–6120.

SUPPLEMENTARY INFORMATION: The ISAC–14 will hold a meeting on December 13, 1999 from 9:15 a.m. to 2:45 p.m. The meeting will include a review and discussion of current issues which influence U.S. trade policy. Pursuant to section 2155(f)(2) of Title 19 of the Untied States Code and Executive Order 11846 of March 27, 1975, the Office of the U.S. Trade Representative has determined that part of this meeting will be concerned with matters the disclosure of which would seriously compromise the development by the United States Government of trade policy, priorities, negotiating objectives or bargaining positions with respect to the operation of any trade agreement and other matters arising in connection with the development, implementation and administration of the trade policy of the United States. During the discussion of such matters, the meeting will be closed to the public from 12:30 p.m. to 2:45 p.m. The meeting will be open to the public and press from 9:15 a.m. to 12:30 p.m., when other trade policy issues will be discussed. Attendance during this part of the meeting is for observation only. Individuals who are not members of the committees will not be invited to comment.

Pate Felts,

Acting Assistant United States Trade Representative, Intergovernmental Affairs and Public Liaison.

[FR Doc. 99–32469 Filed 12–14–99; 8:45 am]

BILLING CODE 3190–01–M

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

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

AGENCY: Federal Aviation Administration (FAA), DOT.

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

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

FOR FURTHER INFORMATION CONTACT: Kristin Larson, Transport Standards Staff, ANM–110, FAA, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Ave. SW., Renton, WA 98055–4056, telephone (425) 227–1760, fax (425) 227–1100.

SUPPLEMENTARY INFORMATION:

Background

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

One area ARAC deals with is transport airplane and engine issues. These issues involve the airworthiness standards for transport category airplanes in 14 CFR parts 25, 33, and 35 and parallel provisions in 14 CFR parts 121 and 135. The corresponding European airworthiness standards for transport category airplanes are contained in Joint Aviation Requirements (JAR)–25, JAR–E and JAR–P, respectively. The corresponding Canadian Standards are contained in Chapters 525, 533, and 535, respectively.

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 6: Aging Aircraft Program (Widespread Fatigue Damage) (WFD)

The FAA requests that ARAC propose new operating rules (14 CFR parts 91, 121, 125, 129, and 135) that would ensure that no large transport category airplane (>75,000 lbs. Gross Take Off Weight) is operated beyond the flight cycle limits to be specified in the regulation, unless an ''Aging Aircraft Program'' has been incorporated into the operator's maintenance program.

The proposed rule and advisory material will establish:

1. The content of the Aging Aircraft Program (e.g., the necessary special inspections and modification actions for prevention of WFD), and

2. A limit of the ''validity'' (in terms of flight cycles or hours) of the Aging Aircraft Program where additional reviews are necessary for continued operation.

Additionally, ARAC is asked to review 14 CFR 25.1529 and 14 CFR part 25, Appendix H, and recommend changes to establish:

1. The required content of an Aging Aircraft Program.

2. The criteria by which to determine the validity of the Aging Aircraft Program (in terms of flight cycles or flight hours). This would effectively prohibit the operation of airplanes beyond the limited validity of the maintenance program. In order to operate beyond the declared limit, further evaluation of the design must be accomplished and the additional inspections and/or modifications added to the Aging Aircraft Program as necessary.

The FAA may ask ARAC to recommend disposition of any substantive comments the FAA receives in response to any of the notices of proposed rulemaking that result from ARAC's recommendations.

The FAA expects ARAC to forward its recommendations to the FAA within 9 months after tasking.

ARAC Acceptance of Task

ARAC has accepted this task and has chosen to assign it to the existing Airworthiness Assurance Working Group. The working group serves as staff to ARAC to assist ARAC in the analysis of the assigned task. Working group recommendations must be reviewed and approved by ARAC. If ARAC accepts the working groups recommendations, it forwards them to the FAA as ARAC recommendations.

Working Group Activity

The 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 ARAC to consider transport airplane and engine issue held following publication of this notice.

2. Give a detailed conceptual presentation of the proposed recommendations, prior to proceeding with its work.

3. Draft appropriate regulatory documents with supporting economic and other required analyses, and any other related guidance material or collateral documents to support its recommendations.

4. Provide a status report at each meeting of ARAC held to consider transport airplane and engine issues.

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

Meetings of ARAC will be open to the public, except as authorized by section 10(d) of the Federal Advisory Committee Act. Meetings of the Airworthiness Assurance Working Group will not be open to the public, except to the extent that individuals with an interest and expertise are selected to participate. No public announcement of working group meetings will be made.

Issued in Washington, DC, on December 9, 1999.

Anthony F. Fazio,

Executive Director, Aviation Rulemaking Advisory Committee.

[FR Doc. 99–32462 Filed 12–14–99; 8:45 am]

BILLING CODE 4910–13–M

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

[Summary Notice No. PE–99–44]

Petitions for Exemption; Summary of Petitions Received; Dispositions of Petitions Issued

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of petitions for exemption received and of dispositions of prior petitions.

SUMMARY: Pursuant to FAA's rulemaking provisions governing the application, processing, and disposition of petitions for exemption (14 CFR Part 11), this notice contains a summary of certain petitions seeking relief from specified requirements of the Federal Aviation Regulations (14 CFR Chapter I), dispositions of certain petitions previously received, and corrections. The purpose of this notice is to improve the public's awareness of, and participation in, this aspect of FAA's regulatory activities. Neither publication of this notice nor the inclusion or omission of information in the summary is intended to affect the legal status of any petition or its final disposition.

DATES: Comments on petitions received must identify the petition docket number involved and must be received on or before January 4, 2000.

ADDRESSES: Send comments on any petition in triplicate to: Federal Aviation Administration, Office of the Chief Counsel, Attn: Rule Docket (AGC–200), Petition Docket No. ________, 800 Independence Avenue, SW., Washington, D.C. 20591.

Comments may also be sent electronically to the following internet address: 9–NPRM–cmts@faa.gov.

The petition, any comments received, and a copy of any final disposition are filed in the assigned regulatory docket and are available for examination in the Rules Docket (AGC–200), Room 915G, FAA Headquarters Building (FOB 10A), 800 Independence Avenue, SW., Washington, D.C. 20591; telephone (202) 267–3132.

FOR FURTHER INFORMATION CONTACT: Cherie Jack (202) 267–7271 or Vanessa Wilkins (202) 267–8029 Office of Rulemaking (ARM–1), Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591.

This notice is published pursuant to paragraphs (c), (e), and (g) of § 11.27 of Part 11 of the Federal Aviation Regulations (14 CFR Part 11).

Issued in Washington, D.C., on December 9, 1999.

Donald P. Byrne,

Assistant Chief Counsel for Regulations.

Docket No.: 29819.

Petitioner: Bombardier.

Section of the FAR Affected: 14 CFR 25.813(e).

Description of Relief Sought: To permit doors between passenger compartments on BD700–1A10 airplanes used for corporate transportation.

Docket No.: 29436.

Petitioner: Airport Services.

Section of the FAR Affected: 14 CFR 145.37(b).

Description of Relief Sought: To permit Airport Services to apply for a Federal Aviation Administration repair station certificate without having suitable permanent housing for at least one of the heaviest aircraft within the weight class of the rating it seeks.

Docket No.: 29411.

Petitioner: Spirit Aviation Inc.

Section of the FAR Affected: 14 CFR 135.225(g).

Description of Relief Sought Disposition: To permit Spirit Aviation to conduct takeoffs in single-pilot, turbine powered airplanes where takeoff visibility is one-half of a mile down to 1,800 feet runway visual range, subject to certain conditions and limitations.

Recommendation Letter

Pratt & Whitney
A United Technologies Company

Pratt & Whitney
400 Main Street
East Hartford, CT 06108

June 29, 2001

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

Attention: Mr. Thomas McSweeny, Associate Administrator, Regulation and Certification

Subject: Aging Aircraft Program (Widespread Fatigue Damage)

Dear Tom,

The Transport Airplane and Engine Issues Group is pleased to forward the attached NPRM and Advisory Circular – Aging Aircraft Program (Widespread Fatigue Damage) to the FAA as a formal ARAC recommendation. These documents were prepared in accordance with a December 1999 tasking by the Airworthiness Assurance Working Group and have completed a formal economic and legal review.

Sincerely yours,

C. R. Bolt

C. R. Bolt
Assistant Chair, TAEIG

*Copies: Chuck Huber (FAA-NWR)
Effie Upshaw (FAA-Washington, D.C.)
Amos Hoggard (Boeing)
Aubrey Carter (Delta)
Kyatsandra Gopinath (Boeing)

*letter only

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AUG 3 2001

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

Dear Mr. Bolt

This letter acknowledges receipt of your June 29 and July 2 letters transmitting recommendations from the Transport Aircraft Engine (TAE) issues area addressing widespread fatigue damage and class B and F cargo compartments.

I would like to thank the Aviation Rulemaking Advisory Committee, particularly those members associated with the TAE issues area and the Airworthiness Assurance Working Group and the Cargo Standards Harmonization Working Group. We appreciate the work and resources that industry has given to the development of the recommendation packages.

At this time, the Federal Aviation Administration (FAA) considers submittal of these recommendations as completion of the tasks. Therefore, we shall close the tasks and keep the TAE apprised of the agency's efforts through the FAA report at TAE meetings. Further, if the proposed rules and advisory material generate substantive or controversial comments once they are published in the *Federal Register*, the FAA may task the ARAC to recommend disposition of the comments.

Sincerely,

Original Signed By
Thomas E. McSweeny

Thomas E. McSweeny
Associate Administrator for Regulation
and Certification

ARM-209:EUpshaw:fs:7/16/01:PCDOCS #15890
cc: ARM-1/20/200/209; ANM-110
File # ANM-93-725-A and ANM-99-369-A
Control Nos. 20012285-0 & 20012283-0

CONCURRENCES	
ROUTING SYMBOL	ARM-209
INITIALS/SIGNATURE	emu
DATE	7/16/01
ROUTING SYMBOL	ARM-20
INITIALS/SIGNATURE	Fh
DATE	7/17/01
ROUTING SYMBOL	ARM-200
INITIALS/SIGNATURE	Courtney
DATE	7/20/01
ROUTING SYMBOL	ANM-110
INITIALS/SIGNATURE	C. huber
DATE	7/16/01
ROUTING SYMBOL	ARM-1
INITIALS/SIGNATURE	TF
DATE	7/23/01
ROUTING SYMBOL	AIR-1
INITIALS/SIGNATURE	JH
DATE	7/30/01
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DATE	

Recommendation

[4910-13-U]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 91, 121, 125, 129 and 135

[Docket No. _____________; Notice No. _____________]

RIN: 2120-

Aging Aircraft Program (Widespread Fatigue Damage)

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed rulemaking.

SUMMARY: The FAA proposes to require incorporation of a program to preclude widespread fatigue damage (WFD) into the FAA-approved maintenance or inspection program of each operator of large transport category airplanes. This action is the result of concern for the continued operational safety of airplanes that are approaching or have exceeded their design service goal. This proposed rulemaking would require a limit of validity (in flight cycles or hours) of the structural maintenance program, where additional inspections and/or modification/replacement actions must be incorporated into the operator's maintenance or inspection programs in order to allow continued operation.

DATES: Send your comments on or before [Insert date 90 days after date of publication in the Federal Register.]

ADDRESSES: Address your comments to the Docket Management System, U.S. Department of Transportation, Room Plaza 401, 400 Seventh Street, SW., Washington, DC 20590-0001. You must identify the docket number _____________ at the beginning of your comments, and you should submit two copies of your comments. If you wish to receive confirmation that FAA received your comments, include a self-addressed, stamped postcard.

You may also submit comments through the Internet to http://dms.dot.gov. You may review the public docket containing comments to these proposed regulations in person in the Dockets Office between 9:00 a.m. and 5:00 p.m., Monday through Friday, except Federal holidays. The Dockets Office is on the plaza level of the NASSIF Building at the Department of Transportation at the above address. Also, you may review public dockets on the Internet at http://dms.dot.gov.

FOR FURTHER INFORMATION CONTACT: Brent Bandley, FAA, Transport Airplane Directorate, Los Angeles Aircraft Certification Office, ANM-120L, 3960 Paramount Boulevard, Lakewood, California 90712-4137; telephone (562) 627-5237, fax (562) 627-5210.

SUPPLEMENTARY INFORMATION:

Comments Invited

Interested persons are invited to participate in the making of the proposed action by submitting such written data, views, or arguments as they may desire. Comments relating to the environmental, energy, federalism, or economic impact that might result from adopting the proposals in this document also are invited. Substantive comments should be accompanied by cost estimates. Comments must identify the regulatory docket or notice number and be submitted in duplicate to the DOT Rules Docket address specified above.

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

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

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

Availability of NPRM

You can get an electronic copy using the Internet by taking the following steps:

(1) Go to the search function of the Department of Transportation's electronic Docket Management System (DMS) web page (http://dms.dot.gov/search).

(2) On the search page type in the last four digits of the Docket number shown at the beginning of this notice. Click on "search."

(3) On the next page, which contains the Docket summary information for the Docket you selected, click on the document number of the item you wish to view.

You can also get an electronic copy using the Internet through the Office of Rulemaking's web page at http://www.faa.gov/avr/armhome.htm or the Federal Register's web page at http://www.access.gpo.gov/su_docs/aces/aces140.html.

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

BACKGROUND

List of Acronyms Used in this Document

For the reader's reference and ease of reading, the following list defines the acronyms that are used throughout this document:

ACRONYM	DEFINITION
AAWG	Airworthiness Assurance Working Group
ACO	Aircraft Certification Office
AD	Airworthiness Directive
ALS	Airworthiness Limitations Section

AMM	Airplane Maintenance Manuals
ARAC	Aviation Rulemaking Advisory Committee
ART	Authority Review Team
CPCP	Corrosion Prevention and Control Program
DER	Designated Engineering Representative
DSD	Discrete source damage
DSG	Design service goal
ESG	Extended service goal
FAA	Federal Aviation Administration
ICA	Instructions for Continued Airworthiness
ISP	Inspection start point
JAA	Joint Airworthiness Authorities
LOV	Limit of Validity
MED	Multiple element damage
MRB	Maintenance Review Board
MSD	Multiple site damage
MSG	Maintenance Steering Group
NDI	Non-destructive inspection
NTSB	National Transportation Safety Board
PMI	Principal Maintenance Inspector
PSE	Principal structural element
RAP	Repairs Assessment Program
SSID	Structural Supplemental Inspection Document
SMP	Structural modification point
SSIP	Supplemental Structural Inspection Program
STC	Supplemental Type Certificate
STG	Structural Task Group
TAD	Transport Airplane Directorate
TC	Type certificate
TCH	Type certificate holder
TOGAA	Technical Oversight Group re: Aging Aircraft
WFD	Widespread fatigue damage

Events Leading to Proposed Rule

In April 1988, a high-cycle transport airplane enroute from Hilo to Honolulu, Hawaii, suffered major structural damage to its pressurized fuselage during flight. The airplane managed to land after a structural failure caused the separation of an 18-foot section of upper fuselage. The National Transportation Safety Board (NTSB) determined that widespread fatigue damage (WFD) was a contributing cause of this accident.

Widespread fatigue damage is characterized by simultaneous presence of cracks at multiple structural details that are of sufficient size and density such that the structure will no longer meet its damage-tolerance requirement and could catastrophically fail. Uniformly loaded structure may develop cracks in adjacent fasteners, or in adjacent similar structural details. These cracks can interact to reduce the damage tolerance of the structure in a manner that may not be readily detectable. Sources of WFD include:

- <u>Multiple site damage (MSD)</u> is a source of WFD characterized by the simultaneous presence of fatigue cracks in the same element (i.e., fatigue cracks that may coalesce with or without other damage, leading to a loss of required residual strength).
- <u>Multiple element damage (MED)</u> is a source of WFD characterized by the simultaneous presence of fatigue cracks in similar adjacent structural elements.

Regulatory and industry experts agree that, as the transport airplane fleet continues to age, eventually WFD is inevitable. Long-term reliance on existing maintenance programs, even those that incorporate the latest mandatory changes introduced to combat aging, creates an unacceptable risk of age-related accidents. Even with the existing aging aircraft program for large transports in place, WFD can and does occur in the fleet. Therefore, the FAA has determined that, at a certain point of an airplane's life, the existing aging aircraft program is not sufficient to ensure the continued airworthiness of that fleet of airplanes.

Since the 1988 accident in Hawaii, the FAA has identified several cases of WFD occurring in the fleet of large transport airplanes, although there has not been a catastrophic accident directly attributable to WFD. Some examples are:

- in-flight failure of aft pressure bulkhead stringer attach fittings on the Lockheed Model L-1011;
- aft pressure bulkhead cracks found on the McDonnell Douglas Model DC-9;
- lap splice cracking found in the Boeing Models 727 and 737; and
- frame cracking found in the Boeing Model 747.

The FAA, the European Joint Airworthiness Authorities (JAA), and representatives of the Airworthiness Assurance Working Group (AAWG), working under the auspices of the Aviation Rulemaking Advisory Committee (ARAC), have reviewed available service difficulty reports for the transport airplane fleet. They also have evaluated the certification and design practices applied to these previously certificated airplanes, including fatigue test results. The review revealed that all airplanes in the fleet are susceptible to some sort of MSD or MED. Based on this review, many areas were identified as those most susceptible to MSD or MED, for example:

AREA	SUSCEPTIBLE TO:
Longitudinal skin joints, frames, and tear straps	MSD/MED
Circumferential joints and stringers	MSD/MED
Fuselage Frames	MED
Lap joints with milled, chem-milled, or bonded radius	MSD
Stringer-to-frame attachments	MED
Shear clip end fasteners on shear tied fuselage frames	MSD/MED
Aft pressure dome outer ring and dome web splices	MSD/MED
Skin splice at aft pressure bulkhead	MSD
Abrupt changes in web or skin thickness — pressurized or unpressurized structure	MSD/MED
Window surround structure	MSD/MED
Overwing fuselage attachments	MED

Latches and hinges of non-plug doors	MSD/MED
Skin at runout of large doubler (MSD)—fuselage, wing or empennage	MSD
Rib to skin attachments	MSD/MED
Typical Wing/Empennage Structure	MSD/MED
Wing and empennage chordwise splices	MSD/MED

<u>NOTE</u>: The FAA has developed a proposed Advisory Circular (AC) 91-56B, "Continuing Structural Integrity Program for Large Transport Category Airplanes," which contains illustrations of the areas susceptible to MSD and/or MED. The availability of that proposed AC is announced elsewhere in this <u>Federal Register</u>.

The FAA has been addressing these safety issues on a case-by-case basis by issuing airworthiness directives (AD) requiring corrective action. The ADs address the immediate problem, but they do not address potential WFD problems that may exist on other components of the aircraft in question, and they are not a proactive means to deal with aging aircraft overall. They also frequently impose added costs on operators because of the necessity of implementing corrective action outside of normal maintenance schedules, and they consume significant regulatory resources on a continuing basis.

ARAC Recommendations Concerning WFD

In 1993, ARAC made seven recommendations to the FAA concerning the need for a structural audit of transport category airplanes to determine the state of WFD in the transport fleet. These recommendations were:

- The AAWG should promote a WFD evaluation of each airplane model within the existing Structures Task Group (STG) environment, using the guidance of AC 91-56, "Supplemental Structural Inspection Program for Large Transport

Category Airplanes" (as modified to include the material mentioned in Recommendation 2, below). These evaluations should be conducted in the timeliest possible fashion relative to the airplane model age.

- AC 91-56 should be modified to include guidelines for conducting a structural WFD evaluation.
- The STGs should recommend appropriate fleet actions, through the Supplemental Structural Inspection Program (SSIP) or service bulletin modification programs.
- The AAWG should be responsible for monitoring evaluation progress and results for consistency of approach for all models.
- Mandatory action should enforce STG recommendations by normal FAA means.
- Additional rulemaking is not necessary or desirable for timely achievement of the evaluation safety goals for the 11 airplane models originally evaluated by the AAWG.
- Additional actions for the airplanes currently in production should only be considered after completion of the initial evaluations of the 11 airplane models originally evaluated by the AAWG.

The basic recommendation was to amend FAA's AC 91-56 to include guidance for a proposed structural audit for WFD. Furthermore, the report advocated that the audit would be performed voluntarily by the STGs under the direction of the manufacturers. Any safety-related issues would be brought to the attention of the FAA for corrective action.

The AAWG developed a new appendix to AC 91-56 that provides guidance on the development of a WFD prediction and verification technique to preclude operation of large transport airplanes in the presence of WFD. ARAC submitted this guidance to the FAA as a recommendation, and the FAA accepted it. In April 1998, the FAA issued AC 91-56A, "Continuing Structural Integrity Program for Large Transport Category Airplanes." That AC contains Appendix 2, entitled "Guidelines for the Development of a

Program to Predict and Eliminate Widespread Fatigue Damage," which is based on the ARAC/AAWG recommendations.

On August 28, 1997 (62 FR 45690), the FAA tasked ARAC again with determining the extent of WFD in the fleet. To obtain the pertinent data, ARAC was to review analytical methods, relevant fatigue test data, related research work, and teardown inspection reports. The review was to take into account the AAWG report "Structural Fatigue Evaluation for Aging Aircraft," dated October 14, 1993.

The FAA also tasked ARAC develop time standards for implementation of a WFD program and to recommend courses of action the FAA might take to address this issue. ARAC assigned this task to the AAWG.

The tasking required that a team of technical experts review the technical program that was developed by the AAWG. The purpose of this review was to validate the approach adopted by the AAWG and to ensure compliance with the tasking. The Authority Review Team (ART) consisted of representatives from the United Kingdom Civil Aviation Authority (UK-CAA), French Direction Générale de l'Aviation Civile (DGAC), and the FAA. The ART conducted its initial review in March 1998, and again in January 1999. It supported the report, with three caveats that have since been resolved.

The AAWG/ARAC completed the tasking and produced a final report entitled "Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Fleet," Revision A, dated June 29, 1999 (hereafter identified as the "WFD Report"). The ARAC submitted the report to the FAA and the FAA accepted the recommendations. [A copy of this report is included in the public docket for this rulemaking].

The list of five items below summarizes a number of recommendations in the WFD Report developed by the FAA, JAA, and AAWG to improve the current structural maintenance program to preclude WFD from the fleet.

1. Clarify the terminology in AC 91-56A.

Related Regulatory Activity

In addition to the initiatives previously discussed, there are other on-going activities that are associated with FAA's Aging Aircraft Program. These include FAA's response to the Aging Aircraft Safety Act, and future rulemaking to mandate corrosion prevention and control programs for all airplanes used in air transportation.

By the Aging Aircraft Safety Act of 1991 (Public Law 49 U.S.C. 44717), Congress instructed the Administrator to prescribe regulations that ensure the continuing airworthiness of aging aircraft through inspections and reviews of the maintenance records of each aircraft an air carrier uses in air transportation.

Proposed Aging Airplane Safety Rule

In response to the Act, the FAA published Notice of Proposed Rulemaking (NPRM) 99-02 on April 2, 1999 (64 FR 16298), entitled "Aging Airplane Safety." The proposed rule would ensure the continued airworthiness of aging airplanes operating in air transportation by applying damage tolerance analysis and inspection techniques through mandatory records reviews and inspections after the airplane's fourteenth year in service. Damage tolerance-based supplemental inspections would be applicable to the baseline structure [as built by the Type Certificate Holder (TCH)] and all major repairs, alterations, and modifications. The damage tolerance-based supplemental inspections would be required 4 years after the effective date of the proposed rule (with certain exceptions for airplanes with mandated AC 91-60 service-based supplemental inspection programs or for airplanes whose design life goal has been listed in the tables provided in the proposed rule).

That proposed rule would be applicable to:

- all airplanes operated under 14 CFR part 121,
- all U.S. registered multi-engine airplanes operated under 14 CFR part 129, and

- all multi-engine airplanes operated in scheduled operations under 14 CFR part 135.

The FAA has reviewed the public comments to that Notice and anticipates regulatory action in the near future based on those comments and other considerations.

Proposed Corrosion Prevention and Control Program Rule

In addition, the FAA has found that some operators do not have a programmatic approach to corrosion prevention and control programs (CPCP). In its accident investigation report (NTSB/AAR-89/03) on the 1988 accident in Hawaii, the NTSB recommended that the FAA mandate a comprehensive and systematic CPCP. Therefore, the FAA is considering rulemaking to mandate CPCPs for all airplanes used in air transportation. More details about this proposed rule are described later in this preamble.

Existing Regulations and Certification Methods

The current 14 CFR part 25 regulations that are intended to require designs to preclude WFD from the fleet are as follows:

Section 25.571(b) requires that special consideration for WFD must be included where the design is such that this type of damage could occur. Also, it must be demonstrated with sufficient full-scale fatigue test evidence that WFD will not occur within the design service goal of the airplane. These requirements were added to § 25.571 at Amendment 25-96 in 1998 (63 FR 23338, April 28, 1998). Therefore, these requirements have only been applied on the most recent type certification projects.

Prior to Amendment 25-96, § 25.571 and its predecessor CAR 4b did not fully address WFD. Prior to Amendment 25-45 (43 FR 46242, October 5, 1978), § 25.571 and CAR 4b-270 required that those parts of the structure whose failure could result in catastrophic failure of the airplane must be evaluated by a fatigue or fail safe analysis, tests, or both. At Amendment 25-45, § 25.571 was changed to require that those parts of the structure whose failure could result in catastrophic failure be evaluated by a damage tolerance assessment.

In general, for large transport category airplanes certified prior to amendment 25-96, the TCHs have conducted full-scale fatigue tests, even though they were not required. In some cases, by additional fatigue testing, teardown, and analysis, the DSG has been changed to an extended service goal (ESG).

Airplane Maintenance Manuals and Instructions for Continued Airworthiness

Historically, TCHs have been required to provide maintenance-related information for structures. Prior to 1970, most TCHs provided manuals containing maintenance information for large transport category airplanes, but there were no standards prescribing minimum content, distribution, and a timeframe in which the information must be made available to the operator. Section 25.1529, which was added to part 25 by amendment 25-21 in February 1970, required the applicant for a type certificate to provide airplane maintenance manuals (AMM) to owners of the airplanes. This section was later amended by amendment 25-54 (45 FR 60173, September 11, 1980) to require that the applicant for type certification provide Instructions for Continued Airworthiness (ICA) prepared in accordance with Appendix H to part 25. In developing the ICA, the applicant is required to include certain information such as a description of the airplane and its systems, servicing information, and maintenance instructions, including the frequency and extent of the structural inspections necessary to provide for the continued airworthiness of the airplane. As required by Appendix H to part 25, the ICA must also include an FAA-approved Airworthiness Limitations section (ALS) enumerating those mandatory inspections, inspection intervals, replacement times, and related procedures approved under § 25.571, relating to structural damage tolerance.

One method of establishing initial scheduled maintenance and inspection tasks is the Maintenance Steering Group (MSG) process, which develops a Maintenance Review Board (MRB) document for a particular airplane model. The resultant of the MSG-3 process is an MRB document that contains inspections of the aircraft to address accidental damage, environmental damage, and fatigue damage. Operators may incorporate those provisions, along with other maintenance information contained in the ICA, into their maintenance or inspection program. Earlier MSG processes were used that may not fully address this issue.

Section 21.50 requires the holder of a design approval [including the TC or supplemental type certificate (STC) for an airplane, aircraft engine, or propeller for which application was made after January 28, 1981] to furnish at least one set of the complete ICA to the owner of the product for which the application was made. The ICA for original type certificated products must include inspection and replacement instructions for the structures. A design approval holder who has modified the structure must furnish a complete set of ICA for the modification to the owner of the product.

Type Certificate Amendments Based on Major Change in Type Design

Over the years, many design changes have been introduced into the structure that may affect their safety. There are three ways that design changes can be approved:

1. The TCH can apply for an amendment to the type design.

2. Any person, including the TCH, wanting to alter a product by introducing a major change in the type design not great enough to require a new application for a TC, may apply for an STC.

3. In some instances, a person also may make a major alteration or repair to the type design through a field approval. The field approval process is a streamlined method for obtaining approval of relatively simple modifications to airplanes. An FAA Flight Standards Inspector can approve a repair or alteration using FAA Form 337.

Maintenance and Inspection Program Requirements

Airplane operators are required to have extensive maintenance or inspection programs that include provisions relating to structure:

Section 91.409(e), which generally applies to other than commercial operations, requires an operator of a large turbojet multi-engine airplane or a turbopropeller-powered multi-engined airplane to select one of the following four inspection programs:

1. An inspection program that is part of a continuous airworthiness maintenance program currently in use by a person holding an air carrier operating certificate, or an operating certificate issued under part 119 for operations under parts 121 or 135, and operating that make and model of airplane under those parts;

2. An approved airplane inspection program approved under § 135.419 and currently in use by a person holding an operating certificate and operations specifications issued under part 119 for part 135 operators;

3. A current inspection program recommended by the type certificate holder; or

4. Any other inspection program established by the registered owner or operator of that airplane and approved by the Administrator.

Section 121.367, which is applicable to those air carrier and commercial operations covered by part 121, requires operators to have an inspection program, as well as a program covering other maintenance, preventative maintenance, and alterations.

Section 125.247, which is generally applicable to operation of large airplanes, other than air carrier operations conducted under part 121, requires operators to inspect their airplanes in accordance with an inspection program approved by the Administrator.

Section 129.14 requires a foreign air carrier and each foreign operator of a U.S. registered airplane in common carriage, within or outside the U.S., to maintain the airplane in accordance with an FAA-approved program.

In general, to develop the overall maintenance or inspection program for their airplanes, operators rely on:

- the Type Certificate (TC) data sheet,
- MRB reports,
- ICA,
- the ALS of the ICA,
- other manufacturer's recommendations, and
- their own operating experience.

They also have maintenance programs related to aging aircraft, such as the following four programs or their equivalents:

1. Supplemental Structural Inspection Programs (SSIP): The SSIPs were traditionally mandated by airworthiness directives for certain large transport category airplanes (Airbus Model A300; British Aerospace BAC 1-11; Boeing Models B-707/720, B-727, B-737, B-747; McDonnell Douglas Models DC-8, DC-9/MD-80, DC-10; Fokker F28; and Lockheed Model L-1011 series airplanes) and numerous other transport category airplanes. The TCHs for these airplanes developed the Supplemental Structural Inspection Document (SSID), which was mandated by AD. These mandated inspection programs supplemented each operator's maintenance program.

The FAA is considering additional rulemaking (see section above on "Related Rulemaking Activity") to require that maintenance or inspection programs of the following airplanes include an FAA-approved SSIP:

- all airplanes operated under part 121,
- all U.S. registered multi-engine airplanes operated in common carriage by foreign air carriers or foreign persons under part 129, and
- all multi-engine airplanes used in scheduled operations operated under part 135.

The airplanes subject to the requirement for a SSIP were not certified to a damage tolerance requirement. However, the structure to be evaluated, the type of damage considered (fatigue, corrosion, service, and production damage), and the inspection and/or modification criteria should, to the extent practicable, be in accordance with the damage-tolerance principles of the current § 25.571 standards. An acceptable means of compliance can be found in AC 25.571-1C or the latest revision which recommends the consideration of the following elements.

It is essential to identify the structural parts and components that contribute significantly to carrying flight, ground, pressure, or control loads, and whose failure could affect the structural integrity necessary for the continued safe operation of the airplane. The damage tolerance or safe-life characteristics of these parts and components must be established or confirmed.

Analyses made in respect to the continuing assessment of structural integrity should be based on supporting evidence, including test and service data. This supporting evidence should include consideration of the operating loading spectra, structural loading distributions, and material behavior. An appropriate allowance should be made for the scatter in life to crack initiation and rate of crack propagation in establishing the inspection threshold, inspection frequency, and, where appropriate, retirement life. Alternatively, an inspection threshold may be based solely on a statistical assessment of fleet experience, provided that it can be shown that equal confidence can be placed in such an approach.

An effective method of evaluating the structural condition of older airplanes is selective inspection with intensive use of nondestructive techniques and the inspection of individual airplanes, involving partial or complete dismantling ("tear-down") of available structure.

The effect of major repairs, alterations, and modifications approved by the TCH should be considered. In addition, it will be necessary to consider the effect of all major repairs and operator-approved alterations and modifications on individual airplanes. The operator has the responsibility for ensuring notification and consideration of any such aspects.

2. Corrosion Prevention and Control Programs (CPCP): The CPCPs were mandated by airworthiness directives (AD) for certain large transport category airplanes (Airbus Model A300; British Aerospace BAC 1-11; Boeing Models B-707/720, B-727, B-737, B-747; McDonnell Douglas Models DC-8, DC-9/MD-80, DC-10; Fokker F28; and Lockheed Model L-1011 series airplanes) and numerous other transport category

airplanes. The TCHs for these airplanes developed the CPCP document that was mandated by AD. These CPCPs supplemented each operator's maintenance program.

The corrosion programs were developed based on the premise that operators would adjust them when unacceptable corrosion levels were found. These maintenance program adjustments should preclude recurrence of unacceptable corrosion findings. Adjustments may include actions such as reduced repetitive task intervals, improved corrosion treatments, or multiple corrosion inhibitor applications.

The FAA is considering additional rulemaking to require that maintenance or inspection programs for the following types of airplanes include an FAA approved CPCP:

- all airplanes operated under part 121,
- all U.S. registered multi-engine airplanes operated in common carriage by foreign air carriers or foreign persons under part 129, and
- all multi-engine airplanes used in scheduled operations operated under part 135.

That proposed rule would give operators two years to incorporate a CPCP into their maintenance or inspection program. (That rulemaking will be issued in response to the Aging Airplane Safety Act of 1991.)

3. Repair Assessment Program: The industry was tasked to develop a method for airlines to evaluate airplane repairs to determine whether they are acceptable permanent repairs incorporating damage tolerance. This program will ensure that existing and future repairs to the fuselage pressure boundary are assessed for damage tolerance.

On April 19, 2000, the FAA issued a final rule entitled "Repair Assessment for Pressurized Fuselages," which promulgated four new operating rules:

- § 91.410 (amdt. 91-264);
- § 121.370 (amdt. 121-275),
- § 125.248 (amdt. 125-33), and

- § 129.32 (amdt. 129-28).

That final rule was published in the Federal Register on April 15, 2000 (65 FR 24108). Additionally, corrections to the final rule were published on June 5, 2000 (65 FR 35703), and August 21, 2000 (65 FR 50744). The final rule's effective date was May 25, 2000. That rule prohibits the operation of certain large transport category airplanes (Airbus Model A300; British Aerospace BAC 1-11; Boeing Models B-707/720, B-727, B-737, B-747; McDonnell Douglas Models DC-8, DC-9/MD-80, DC-10; Fokker F28; and Lockheed Model L-1011 series airplanes) operated under parts 91, 121, 125, and 129 beyond a specified compliance time, unless the operator of those airplanes had incorporated FAA-approved repair assessment guidelines applicable to the fuselage pressure boundary (fuselage skin, door skin, and bulkhead webs) in its operation specification(s) or approved inspection program, as applicable. That rule ensures that a comprehensive damage tolerance repair assessment be completed for repairs to the fuselage pressure boundary.

The FAA also issued an associated advisory circular: AC 120-73, "Damage Tolerance Assessment of Repairs to Pressurized Fuselages," dated December 14, 2000. That AC provides an acceptable means of compliance with the regulations that require incorporating FAA-approved repair assessment guidelines into an operator's FAA-approved maintenance or inspection program.

4. Mandatory Modifications Program: The mandatory modification program was based on the premise that, to ensure the structural integrity of older airplanes, there should be less reliance on repetitive inspections when certain criteria exist. These criteria included:

- There is a high probability that structural cracking exists.
- There is a potential airworthiness concern.
- The cracks are difficult to detect during regular maintenance.

  (Considerations under this criterion are: the areas to inspect are difficult to access; NDT methods are unsuitable; and human factors associate with the inspection technique are so adverse that crack detection may not be sufficiently dependable to assure safety.)

- There is adjacent structural damage or the potential for it.

The FAA issued airworthiness directives that incorporated the structural modification program on the original eleven models (Airbus Model A300; British Aerospace BAC 1-11; Boeing Models B-707/720, B-727, B-737, B-747; McDonnell Douglas Models DC-8, DC-9/MD-80, DC-10; Fokker F28; and Lockheed Model L-1011 series airplanes). Each of the TCHs, with their respective operators, reviewed their service bulletins with the FAA to determine which areas of structure needed modifications to terminate the inspections. Then the revised service bulletins that included those terminating modifications were either grouped in a document and mandated, or each service bulletin was mandated individually.

These four programs or their equivalent make up the current structural maintenance program that operators incorporate into their maintenance or inspection programs to address aging structural issues. However, additional maintenance actions are necessary to address WFD issues Specific maintenance instructions to detect and correct conditions that degrade the structural capabilities due to WFD were not previously deemed necessary because it was assumed that the current structural maintenance and inspection programs would be enough to protect the structure.

Also, the validity of the current structural maintenance program is not limited to a number of flight cycles or flight hours. Certain structural components may be limited and must be replaced at a certain number of flight cycles or flight hours; but if the operator accomplishes the maintenance or inspection program as outlined, they can operate the airplanes indefinitely.

DISCUSSION OF THE PROPOSAL

FAA's review of the service history, design features, and maintenance instructions of the transport fleet indicates that aging of structures susceptible to MSD and MED, which could eventually lead to WFD, has become a safety issue for the fleet of transport category airplanes greater than 75,000 pounds (maximum takeoff gross weight). The FAA proposes to amend the current regulations in two areas to prevent WFD.

1. The first requirement concerns the need to limit the validity of the current structural maintenance program.

2. The second requirement concerns the need to impose operational requirements that mandate a structural maintenance program to prevent WFD in the fleet on baseline, repaired, altered, and modified structure. For the purposes of this proposed rule, baseline structure is defined as "the structure that was originally designed and built by the TCH."

These proposed operational rules would apply only to large transport airplanes greater than 75,000 pounds (maximum takeoff gross weight). The FAA recognizes that this does not align with the "One Level of Safety" initiative (i.e., the same safety level for large airplanes as well as commuter/small airplanes). However, there are two reasons for not including the commuter and smaller airplanes in this rulemaking at this time:

First, in addressing the Aging Aircraft Safety Act of 1991, there already has been considerable rulemaking activity to establish mandated SSIP, CPCP, structural modifications, and repair assessment programs for all aircraft operated under part 121, all U.S.-registered multi-engine aircraft operated under part 129, and all multi-engine aircraft used in scheduled operations under part 135. The TCHs and operators of large transport airplanes have been involved with mandated CPCP and damage tolerance-based SSIPs for many years now and are positioned to address the advanced technical issues of how to handle WFD.

Second, several of the initiatives of the Aging Aircraft Safety Act of 1991 are being accomplished to bring commuter aircraft in line with aging aircraft programs that have already been accomplished on the large transports for several years now. However, the Aging Commuter Aircraft Program is not yet as mature as the Large Transport Aging Aircraft Program. In many cases, commuter aircraft TCHs are developing CPCPs and damage tolerance-based SSIPs for the first time. Further, many of these commuter aircraft were originally certified to safe-life and fail-safe rules, so the aircraft TCHs are not familiar with analyzing airplanes using damage tolerance principles. The FAA has funded development of damage tolerance-based SSIPs to help foster this development process for the smaller aircraft. Damage tolerance-based SSIP final rules for the commuter airplanes are not scheduled to be mandated until FY 2000. ***[Update???]*** The CPCP final rule may not be issued until FY 2002.

Proposed Operating Requirements

In each operational rule part, the proposed rule would impose two new operating rules. These are described below:

Operational Rule 1 – Basis of Structural Maintenance Program

The first operating rule, entitled "Basis of Structural Maintenance Program," would prohibit the operation of transport category airplanes greater than 75,000 pounds (maximum takeoff gross weight) unless the ALS of the ICA that includes the flight cycle or flight hour limits of validity of the structural maintenance program is incorporated in its maintenance or inspection program within 12 months after the effective date of the proposed rule. Regardless of the certification basis, the initial limit of validity chosen must ensure that WFD is precluded from the fleet up until the limit has been reached by that airplane.

Currently, only airplanes certified to the damage-tolerance requirements of § 25.571 at or after amendment 25-54 have an ALS incorporated into their ICA. This proposed rule would make that a requirement for all affected transport category airplanes greater than 75,000 lbs. (maximum takeoff gross weight).

Acceptable elements of the current aging aircraft program would be included or referenced in the ALS of the ICA. The following is a summary of the current aging aircraft structural maintenance program:

1. Acceptable mandatory modifications programs are those programs that have reviewed all relevant service bulletins and have produced a document that lists those service bulletins with applicable terminating modifications that has been mandated by an airworthiness directive. Not all of the terminating modifications are in a single document. There may be airworthiness directives that mandate terminating modifications for individual service bulletins.

2. An acceptable CPCP includes those CPCP documents that were mandated by airworthiness directives. The CPCP mandated by airworthiness directives should be referenced in the ALS of the ICA. Also, for airplanes certified to the damage tolerance requirements at or after amendment 25-54, and for those operators that have incorporated a maintenance program in accordance with MSG-3, Revision 2, an acceptable CPCP is found in the MRB document for those items listed under environmental damage (ED). (As indicated previously, the FAA is considering additional rulemaking to require that maintenance or inspection programs for transport category airplanes include an FAA approved CPCP.)

3. An acceptable SSIP includes those SSIDs developed in accordance with AC 91-56 that are mandated by ADs. Those mandated SSIDs would be referenced in the ALS of the ICA. Also, an acceptable SSIP would be the ALS of the ICA itself, for those airplanes certified to the damage tolerance requirements at or after Amendment 25-54. Also the "Aging Airplane Safety" rule will require damage tolerance-based SSIPs be required 4 years after the effective date of the proposed rule.

4. An acceptable RAP for the fuselage pressure boundary is found for the 11 original "aging models" listed in §§ 91.410, 121.370, 125.248, and 129.32. Airplanes certified to the damage tolerance requirements at or after Amendment 25-45 should have

acceptable repair assessment programs. As part of their certification basis, operators should be assessing repairs for damage tolerance. The Aging Airplane Safety rule will require some operators to develop damage tolerance based supplemental inspections for all major repairs, alterations and modifications to baseline structure within 4 years after the effective date of the rule.

With these aging aircraft structural maintenance programs in place, the TCH will need to establish a limit to the current structural maintenance program in flight cycles or flight hours for a particular airplane model. The limit of validity chosen must ensure that WFD is precluded from the fleet up until the limit has been reached by that airplane, at which time the airplane stops operating or continues to operate based on a maintenance program designed to preclude the occurrence of WFD in the fleet. The FAA expects that, typically, the TCH will choose to limit the airplane at the DSG. The DSG was usually established by the TCH as a period of time (in flight cycles/hours), established at design or certification, during which the principal structure will be reasonably free from significant cracking. Most of the TCHs performed fatigue tests on their airplane models to twice the life delineated in the DSG. Some of the TCHs did additional fatigue testing, teardown, in-service evaluations and analysis to establish an ESG.

When the DSG/ESG were originally conceived, the industry believed that airplanes would be retired before reaching these goals. In some cases, however, airplanes have been operated well beyond the DSG. Therefore, it is imperative to limit the validity of the current structural maintenance program until the maintenance program addresses inspections and/or modification/replacement of structure to prevent WFD in the fleet.

As a result of the AAWG activities, the TCHs have agreed to develop or revise, for each affected airplane model, the ALS of the ICA to reference the applicable aging aircraft programs delineated above and to establish a limit of validity to the current structural maintenance program (in flight cycles/hours). (A copy of these ALS documents is included in the public docket for this rulemaking.) The TCH should ensure that the limits of validity chosen will ensure that the probability of WFD in the fleet is very low. The FAA will entertain any other entities (e.g. operators) that would like to establish the limit of validity for a particular model based on their knowledge of the model and its susceptibility to WFD. Once the FAA is satisfied the limits of validity chosen are appropriate, the ALS will receive a "conditional" approval by the FAA ACO or office of the Transport Aircraft Directorate (TAD) having cognizance over the type certificate before publication of this NPRM.

Operational Rule 2 – Aging Aircraft Program

The second operating rule, entitled "Aging Aircraft Program (Widespread Fatigue Damage)," would require a three-part compliance:

First, for baseline structure, this proposed rule would prohibit the operation of certain transport category airplanes greater than 75,000 pounds (maximum takeoff gross weight) beyond the flight cycle limits shown in its ALS of the ICA, or 12 months after the effective date of the proposed rule, whichever occurs later, unless a structural maintenance program is incorporated within its maintenance or inspection program. This new program must include inspections and/or modification/replacement actions to the baseline structure for prevention of WFD. The baseline structure is defined as that airplane structure that was originally built by the TCH.

The new structural maintenance program will be limited by flight cycles or flight hours, which must be specified in the ALS that has been approved by the FAA ACO or office of the TAD, having cognizance over the type certificate for the affected airplane. Any subsequent revisions to the structural maintenance program for WFD must also be approved by the FAA ACO of office of the TAD having cognizance over the type certificate for the affected airplane before they can be incorporated within the operator's maintenance or inspection program.

For the baseline structure, most of the major TCHs have agreed to publish the inspection procedures and modification/replacement as necessary to preclude WFD in the fleet for those airplanes that have exceeded their DSG or ESG by December 31, 2001 and will require "conditional" approval by the FAA ACO or office of the TAD having cognizance over the type certificate. (A copy of that documentation for airplanes that have exceeded their DSG/ESG has been provided in the public docket for this rulemaking action). The operator could choose to incorporate that program to meet the proposed requirement.

If the TCH chooses not to develop inspection procedures and modification/replacement as necessary to preclude WFD in the fleet, then the operator would not be able to operate the airplane beyond the limit of validity established in the ALS of the ICA. The operator would also have the option of developing its own program independently to address WFD in its fleet, and ultimately would be responsible for gaining FAA approval.

<u>Second</u>, for structure with existing repairs or alterations, this proposed rule also would prohibit operation of certain transport category airplanes greater than 75,000 pounds (maximum takeoff gross weight), 48 months after initial incorporation of the structural maintenance program for the baseline structure or 48 months beyond the time that the airplane has accumulated the flight cycles shown in the limit of validity manifested in its ALS of the ICA, whichever occurs later, unless a structural maintenance program is incorporated within its maintenance or inspection program. This new program must include inspections and/or modifications/replacement actions for repairs, alterations, or modifications susceptible to MSD/MED or repairs, alterations or modifications that affect baseline structure that is susceptible to MSD/MED accomplished prior to the effective date of this proposed rule for the prevention of WFD. . The new structural maintenance program must be approved by the FAA ACO or office of the TAD, having cognizance over the type certificate for the affected airplane. The proposed rule would specify that certain tasks would need to be accomplished within the noted 48-month time frame, including:

- Within six months, operators establish a plan to address repairs, alterations and modifications, which includes identification of interim inspections of applicable repairs, alterations, and modifications. Each operator submits that plan to the FAA ACO or office of the TAD through the operator's PMI.
- Within six months after receipt of the plan, the FAA ACO or office of the TAD approves the plan if it is acceptable.
- Within six months after receipt of the FAA approved plan, each operator incorporates interim inspections of applicable repairs, alterations, and modifications identified in the plan.
- Within 36 months after initial incorporation per paragraph (a) or within 36 months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its ALS of the ICA, whichever occurs later, each operator submits the structural maintenance program to the FAA ACO or office of the TAD through the operator's PMI.
- Within six months after receipt of the structural maintenance program, the FAA ACO or office of the TAD approves the program if it is acceptable.
- Within 48 months after initial incorporation per paragraph (a) or within 48 months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its ALS of the ICA, whichever occurs later, each operator incorporates the FAA approved program into its maintenance program.

Third, for new repairs and alterations (installed after effective date of this NPRM), the proposed rule also would prohibit operation of certain transport category airplanes, greater than 75,000 pounds (maximum takeoff gross weight), 18 months after a repair, alteration or modification susceptible to MSD or MED or a repair, alteration or modification that affects baseline structure that is susceptible to MSD or MED is accomplished on or after the effective date of the rule, unless an appropriate threshold for inspection and/or replacement is incorporated within its maintenance program. This new program must include a threshold where inspections and modification/replacement actions to said repair, alteration, or modification must be incorporated to preclude WFD. The new structural maintenance program must be approved by the FAA ACO or office of the TAD, having cognizance over the type certificate for the affected airplane. The following requirements are to be accomplished at the times noted below:

- The static strength approval of the repair, alteration, or modification is to be accomplished before further flight.
- Within 18 months of the static strength approval, a damage-tolerance analysis that includes a WFD analysis of the repair, alteration or modification is approved by the FAA ACO or office of the TAD, which defines the threshold for inspections and/or modification/replacement actions is included in the operators FAA approved structural maintenance program.
- Within 24 months before reaching the threshold, specific FAA approved inspection methods and repeat intervals are incorporated for each repair, alteration or modification into the FAA approved structural maintenance program.

The intent of the rule is to require operators first to incorporate a program to preclude WFD in the fleet for baseline structure. Then, the operators would be required to develop a plan, and eventually a structural maintenance program, to preclude WFD in the fleet for repaired, altered, or modified structure. The plan would be developed by the operators and must be based on a survey of their fleet to identify MSD/MED susceptible areas that should be inspected in the interim while the structural maintenance program is being developed. The plan would be sent to the FAA ACO or office of the TAD, having cognizance over the type certificate through the operator's PMI and, if acceptable, would approve the plan with a letter signed by the Manager of the ACO or office of the TAD, as appropriate.

Once the plan is approved, the operator would need to begin inspecting areas of the structure susceptible to MSD/MED. Also, the operator would be required to conduct a WFD assessment of the repaired, altered, or modified structure. The analysis to support the WFD assessment and any new inspections or modification/replacement schedules would need to be FAA-approved.

Once the WFD assessment is completed, the operator would be required to develop a structural maintenance program and submit it to the FAA ACO or office of the TAD through the PMI for approval. Once the approval is obtained, the operator would incorporate the structural maintenance program into its maintenance or inspection program.

The structural maintenance program provided by the manufacturer does not generally apply to structure modified by repairs, alterations, or modifications (e.g., modification installed via an STC). However, under this proposed rule, the operator would still be responsible to conduct a survey of its fleet and provide a WFD assessment of affected structure that meets the program objectives of precluding WFD in the operator's fleet.

The FAA recognizes that operators do not usually have the resources to determine an inspection and/or modification/replacement schedule. The FAA expects the STC holder to assist the operators in preparing the required documents. If the STC holder is out of business, or is otherwise unable to provide assistance, the operator will have to accomplish WFD assessment independently. To keep the airplanes in service, it is possible for operators, individually or as a group, to hire the necessary expertise to develop and gain approval of WFD assessments and the associated an inspection and/or modification/replacement schedule. Ultimately, the operator remains responsible for the continued safe operation of the airplane.

The cost and difficulty of developing WFD assessments for repaired, altered, or modified structure may be less than that for the basic airplane structure for various reasons. Of those repairs, alterations, or modifications that do affect the structure, many are small enough that the structure may not be susceptible to MSD/MED (i.e., an antenna installation with a small hole in the middle of two frame bays.) Also, the modification may have been made so recently that no supplemental inspections would be needed for many years. For example, in the case of a large cargo door, such installations are often made after the airplane has reached the end of its useful life as a passenger-carrying airplane. For new structure, the clock would start on WFD assessment at the time of installation. Further, since the inspection start point is measured in cycles, and cargo operation usually entails fewer operational cycles than passenger operations, the due date for incorporation of the non-destructive inspection (NDI) and procedures for that structure could be many years away.

To assist operators and STC holders, the TCH maintenance program documents will contain general guidelines developed along strict boundaries for the screening of repairs, alterations, and STCs.

The operator, normally in conjunction with the TCH, would need to consider the following three things:

1. The means by which the FAA-approved structural maintenance program that addresses WFD are incorporated into a certificate holder's FAA-approved maintenance or inspection program, as would be required by the proposed rule, is subject to approval by the certificate holder's PMI or other cognizant airworthiness inspector.

2. This rule would not impose any new reporting requirements; however, normal reporting required under §§ 121.703 and 125.409 would still apply.

3. This rule would not impose any new FAA recordkeeping requirements. However, as with all maintenance, the current operating regulations (e.g., 14 CFR §§ 121.380 and 91.417) already impose recordkeeping requirements that would apply to the actions required by this proposed rule. When incorporating the structural maintenance program that addresses WFD into its approved maintenance or inspection

program, each operator should address the means by which it will comply with these recordkeeping requirements. That means of compliance, along with the remainder of the program, would be subject to approval by the cognizant PMI or other cognizant airworthiness inspector.

In summary, based on discussions with representatives of the affected industry, recommendations from ARAC, and a review of current rules and regulations affecting WFD, the FAA has determined there is a need for a structural maintenance program, including inspections and modification/replacement actions, for the prevention of WFD to be incorporated into the maintenance or inspection program for certain transport category airplanes.

Possible Airworthiness Directives

For airplanes certified to § 25.571, pre-Amendment 25-54, this proposed rule would create a new ALS of the ICA. The proposed rule would set a limit of validity (in flight cycles or hours) in the ALS of the ICA of the current structural maintenance program for each applicable model. If no program to preclude WFD in the fleet is incorporated by the operator in their maintenance or inspection program, then the operator could not operate the airplane beyond the established flight cycle or flight hour limit.

If the TCH conducts a structural evaluation of the baseline structure for WFD and develops a program to preclude WFD in the fleet, then the TCH would develop a new limit (in flight cycles or flight hours) to the structural maintenance program beyond which the airplane could not be operated. The new limit should be referenced in a revision to the ALS of the ICA and submitted to the FAA for approval. The Administrator would approve the new revision to the ALS of the ICA with a letter of approval. If the new limit is less than the original limit established by the TCH, then the Administrator will need to mandate that limit referenced in the revise ALS of the ICA with an AD.

During the time that the TCH is conducting a structural evaluation for WFD of baseline structure, or the operator is conducting a structural evaluation for WFD of repaired, altered, or modified structure, an unsafe condition may be identified that must be rectified by immediate inspections and/or modification/replacement of structure. If this occurs, the FAA will mandate those actions by issuing an appropriate AD.

Structural Evaluation for WFD

The likelihood of the occurrence of fatigue damage in an airplane's structure increases with airplane usage. The design process generally establishes a DSG in terms of flight cycles/hours for the airframe. It is expected that any cracking that occurs on an airplane operated up to the DSG will occur in isolation (i.e., local cracking), originating from a single source, such as a random manufacturing flaw (e.g., a mis-drilled fastener hole) or a localized design detail. It is considered unlikely that cracks from manufacturing flaws or localized design issues will interact strongly as they grow.

With extended usage, uniformly loaded structure may develop cracks in adjacent fastener holes, or in adjacent similar structural details. These cracks, while they may or may not interact, can have an adverse affect on the large damage capability (LDC) before the cracks become detectable. The development of cracks at multiple locations (both MSD and MED) also can result in strong interactions that can affect subsequent crack growth, in which case the predictions for local cracking would no longer apply. An example of this situation may occur at any skin joint where load transfer occurs. Simultaneous cracking at many fasteners along a common rivet line may reduce the residual strength of the joint below required levels before the cracks are detectable under the routine maintenance program established at time of certification.

The operator, normally in conjunction with the TCH, is expected to initiate the development of a maintenance program with the intent of precluding operation with WFD. Such a program must be implemented before WFD may develop in the fleet as substantiated by analysis, tests, and/or service experience. Because of the small probability of occurrence of MSD/MED in airplane operation up to its DSG, maintenance programs developed for initial certification have generally considered only local fatigue cracking. Therefore, as the airplane reaches its DSG, it is necessary to take appropriate action in the aging fleets to preclude WFD so that continued safe operation of the airplane is not jeopardized. The TCH and /or the operator(s) should conduct structural evaluations to determine where and when MSD/MED may occur. Based on these evaluations the TCH and in some cases the operators would provide additional maintenance instructions for the structure as appropriate. The maintenance instructions include, but are not limited to:

- inspections,
- structural modifications, and
- limits of validity of the new maintenance instructions.

In most cases, a combination of inspections and/or modifications/replacements is deemed necessary to achieve the required safety level. Other cases will require modification or replacement if inspections are not viable.

Before MSD/MED can be addressed, it is expected that the operators will incorporate an augmented structural maintenance program that includes the Mandatory Modifications Program, CPCP, SSIP and RAP to address structural degradation such as corrosion, accidental damage and fatigue.

The structural evaluation for WFD has three objectives:

1. Identify primary structure susceptible to MSD/MED.
2. Predict when it is likely to occur.
3. Establish additional maintenance actions, as necessary, to ensure continued safe operation of the airplane.

Structure Susceptible to MSD/MED

Susceptible structure is defined as that which has the potential to develop MSD/MED. Such structure typically has the characteristics of multiple similar details operating at similar stresses where structural capability could be affected by interaction of multiple cracking at a number of similar details. There are a number of generic types of structure that have demonstrated the development of MSD/MED in service. These structural details are illustrated in proposed AC 91-56B, Appendix 2, Section 3(b). (**NOTE**: The illustrations contained in proposed AC 91-56B are by no means exhaustive and are included to stimulate the review of all possible structure.)

WFD Evaluation

By the time the high time airplane of a particular model reaches its DSG, the evaluation for each area susceptible to the development of WFD should be completed. This evaluation will establish the necessary elements to determine a maintenance program to preclude WFD in that particular model's commercial airplane fleet. These elements are developed for each susceptible area and include:

- Determination of WFD Average Behavior in the Fleet.
- Initial Crack/Damage Scenario.
- Final Cracking Scenario.
- Crack Growth Calculation.
- Potential for Discrete Source Damage (DSD).
- Analysis Methodology Issues.
- Inspection Start Point (ISP).
- Structural Modification Point (SMP).
- Inspection Interval and Method.

(One means of developing these elements is discussed in detail in proposed AC 91-56B, Appendix 2.)

Evaluation of Maintenance Actions

For all areas that have been identified as susceptible to MSD/MED, the current maintenance program should be evaluated to determine if adequate structural maintenance and inspection programs exist to safeguard the structure against unanticipated cracking or other structural degradation. The evaluation of the current maintenance program typically begins with the determination of the SMP for each area.

Each area should then be reviewed to determine the current maintenance actions that are directed against the structure and compare them to the maintenance requirements.

- Determine the inspection requirements (method, reliability, inspection start point, and repeat interval) of the inspection for each susceptible area (including that structure that is expected to arrest cracks) that is necessary to maintain the required level of safety.
- Review the elements of the existing maintenance programs already in place
- Revise and highlight elements of maintenance program necessary to maintain safety.

For susceptible areas approaching the SMP, where the SMP will not be increased, or for areas that cannot be reliably inspected, a program should be developed, and documented that provides for replacement or modification of the susceptible structural area.

Period of Evaluation Validity

The initial evaluation of the complete airframe should cover a significant forward estimation of the projected airplane usage beyond its DSG, also known as the "Proposed ESG." Typically, an assessment through at least an additional twenty-five percent of the DSG would provide a realistic forecast with reasonable planning time for necessary maintenance action.

Upon completion of the evaluation and publication of the revised maintenance requirements, the Proposed ESG becomes the ESG. Subsequent evaluations should follow similar validity period guidelines as the initial evaluation.

Documentation

Any person developing a program to comply with the proposed rule must develop a document containing recommendations for inspection procedures and replacement or modification of parts or components necessary to preclude WFD, and establish the new limit of validity of the operator's maintenance program. That person also must revise the SSID or ALS, as necessary, and/or prepare service bulletins that contain the recommendations for inspection procedures and replacement or modification of parts or components necessary to preclude WFD.

The new limit of validity of the ALS of the ICA and the program documents containing inspection procedures and replacement actions must be submitted to the FAA ACO or office of the TAD cognizant over the type certificate. If acceptable, the FAA ACO or office of the TAD will approve the new limit of validity of the ALS of the ICA by letter signed by the Manager of the FAA ACO or office of the TAD, as appropriate.

In addition, any service bulletins or other service information publications revised or issued as a result of in-service MSD/MED findings resulting from implementation of these programs may require separate AD action.

(**NOTE**: Details of the documentation required by the FAA are contained in proposed AC 91-56B, Appendix 2.)

Reporting Requirements

Operators and TCHs are required to report failures, malfunctions, defects, mechanical reliability, etc. in accordance with various regulations (e.g., § 121.703, § 21.3, etc.). While these reporting requirements would not be modified for this proposed rule, both the operators and the TCHs should be cognizant of the following issues concerning reporting:

Due to the potential threat to structural integrity, the results of inspections must be accurately documented and reported in a timely manner to preclude the occurrence of WFD. The current system of operator-manufacturer communication has been useful in identifying and resolving a number of issues that can be classified as WFD concerns. MSD/MED has been discovered via fatigue testing and in-service experience. Airplane TCHs have been consistent in disseminating related data to operators to solicit additional service experience. However, a more thorough means of surveillance and reporting is essential to preclude WFD.

When damage is found while conducting a FAA-approved MSD/MED inspection program or at SMP where replacement or modification of the structure is occurring, the TCHs, STC Holder and the operators need to ensure that greater emphasis is placed on accurately reporting the following items:

- A description (with a sketch) of the damage, including crack length, orientation, location, flight cycles/hours and condition of structure.
- Results of follow-up inspections by operators that identify similar problems on other airplanes in the fleet.
- Findings where inspections accomplished during the repair or replacement/modification identify additional similar damage sites.
- Adjacent repairs within the same PSE.

Operators should report all cases of MSD/MED to the TCH, STC Holder, or the FAA as appropriate, irrespective of how frequently such cases occur. Cracked areas from in-service airplanes (damaged structure) may be needed for detailed examination. Operators are encouraged to provide fractographic specimens whenever possible. Airplanes undergoing heavy maintenance checks are perhaps the most useful sources for such specimens.

Operators should remain diligent in the reporting of potential MSD/MED concerns not identified by the TCH. Indications of a developing MSD/MED problem may include:

- damage at multiple locations in similar adjacent details;
- repetitive part replacement; or

- adjacent repairs with similar types of damage.

Documentation will be provided by the TCH, STC Holder as appropriate to specify the required reporting format and time frame. The data will be reviewed by the TCH/STC Holder, operator(s), and regulatory authority to evaluate the nature and magnitude of the problem and to determine the appropriate corrective action.

Structural Modifications, Repairs, and Alterations

Operators are responsible for ensuring that all major modifications (STCs), repairs, and alterations that create, modify, or affect structure that has been identified by the TCH as susceptible to MSD/MED are evaluated to demonstrate the same confidence level as the original manufactured structure (i.e., a "two life-time fatigue test"). The operator will need to conduct a survey on each of its airplanes to determine what modifications, repairs, or alterations would be susceptible to MSD/MED. The following are examples of modifications, repairs, and alterations with such concerns:

- passenger-to-freighter conversions (including addition of main deck cargo doors);
- gross weight increases (increased operating weights, increased zero fuel weights, increased landing weights and increased maximum takeoff weights);
- installation of fuselage cutouts (passenger entry doors, emergency exit doors or crew escape hatches, fuselage access doors and cabin window relocations);
- complete re-engine and/or pylon modifications;
- engine hush-kits and nacelle alterations;
- wing modifications such as the installation of winglets or changes in flight control settings (flap droop), and alteration of wing trailing edge structure;
- modified, repaired, or replaced skin splices; and

- any modification, repair, or alteration that affects several stringer or frame bays.

Other potential areas that must be considered include:

- A modification that covers structure requiring periodic inspection by the operator's maintenance program. Modifications must be reviewed to account for the differences with the TCHs baseline maintenance program requirements.
- A modification that results in operational mission change that significantly changes the manufacture's load/stress spectrum. An example of this would be a passenger-to-freighter conversion.
- A modification that changes areas of the fuselage from being externally inspectable using visual means to being uninspectable. An example would be the installation of a large external fuselage doubler that results in hiding details beneath it, rendering them visually uninspectable.

Aging Aircraft Program Implementation Time

The applicability of this WFD structural evaluation has been expanded from the eleven aging fleet models initially evaluated by the AAWG. (The AAWG evaluation is contained in the AAWG's report, "Structural Fatigue Evaluation for Aging Aircraft," dated October 14, 1993. That report has been made a part of the public docket for this proposed rulemaking action.) This proposed rule would apply to all large transport category airplanes having a maximum takeoff gross weight (MTOGW) greater than 75,000 pounds, which have been certified to either a pre- or post- amendment 25-45 certification basis.

In order to ensure that the WFD evaluation is completed in a timely manner, with respect to the actual service life accumulated, the FAA has established the following fleet selection criteria, based on the DSG or the ESG:

1. Airplane cycle age is greater than the DSG or ESG on the effective date of the final rule. The operator would be required to incorporate an aging aircraft program including inspections and modifications/replacement actions for prevention of WFD in its maintenance or inspection program by the flight cycle limits shown in its ALS of the ICA, or one year after the effective date of the rule, whichever occurs later. It is conceivable that the operator will need to replace or modify baseline structure on airplanes that have operated beyond the SMP noted in the program documents (inspections and replacement/modification actions) that address WFD for that structure. The operator should begin planning as soon as possible for this eventuality to ensure that the necessary maintenance is performed with as little disruption of fleet utilization as possible. The operator also should be making a survey of all those repairs, alterations, and modifications that are susceptible to MSD/MED, and producing a plan for FAA approval.

2. Airplane cycle age is greater than 75% DSG or ESG, but less than DSG or ESG on the effective date of the final rule. The WFD structural audit program development should have begun by this time. Operators should be making a survey of all those repairs, alterations, and modifications that are susceptible to MSD/MED, and initiating a plan for FAA approval.

3. Airplane cycle age is greater than 50% DSG or ESG, but less than 75% DSG or ESG on the effective date of the final rule. The WFD structural audit program should be in the preliminary planning stages by this time. The operator should be planning to perform a survey of all those repairs, alterations, and modifications that are susceptible to MSD/MED.

FAA Advisory Material

In addition to the amendments proposed in this notice, the FAA has proposed to revise AC 91-56A to AC 91-56B, "Continuing Structural Integrity Program for Large Transport Category Airplanes." The proposed revised AC would provide guidance for operators of the affected transport category airplanes on how to incorporate an FAA-approved "Aging Aircraft Program" into their FAA-approved maintenance or inspection program. Public comments concerning the proposed AC are invited by separate notice published elsewhere in this issue of the Federal Register

Paperwork Reduction Act

The Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) requires that the FAA consider the impact of paperwork and other information collection burdens imposed on the public. We have determined that there are no new information collection requirements associated with this proposed rule.

International Compatibility

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

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

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

In conducting these analyses the FAA has determined that this proposed rule: (1) has benefits that justify its costs; is "a significant regulatory action," as defined in Executive Order 12866; and is "significant," as defined in the Department of Transportation's regulatory policies and procedures (44 FR 11034, February 26, 1979); (2) would have a significant impact on a substantial number of small entities; (3) would not constitute a barrier to international trade; and (4) would not impose an unfunded mandate on State, local, or tribal governments, or the private sector. These analyses are available in the docket and are summarized below. The FAA invites the public to provide comments and supporting data on the assumptions made in this evaluation. All comments received will be considered in any final regulatory evaluation.

Benefits

Current inspection programs are unlikely to uncover WFD problems with airplanes. However, WFD has a positive probability of occurring as the number of cycles exceeds the established limit of validity of the airplanes.

Over the course of the past 17 years, there have been three or more WFD-related accidents or incidents involving sudden depressurizations or other major in-flight disruptions that have resulted in property damage and/or loss of life. Without the proposed WFD program, it is likely that this same experience would be repeated in the future. In the event of an accident, the fleet of that airplane type would be grounded until the affected structure is inspected and/or modified/replaced, with resulting losses in airline income and potential losses to consumers. In addition, in the absence of the proposed rule, airplanes are more likely to be grounded unexpectedly when MSD or MED are detected. If not addressed, MSD or MED may cause the residual strength of airplane structure to fall below the damage tolerant requirements which would result in a WFD condition.

The benefits of the proposed regulation over the planning horizon would be:

Avoided accident costs—C_{t1}

Avoided fleet groundings—C_{t2}.

The expected value of these benefits is:

$$(1) \qquad PV(B) = PV_t\,[A(L_t)\,(C_{t1} + C_{t2}) + P(C_{t2})]$$

which says in words that the present value (PV) of the avoided costs over the planning horizon (t) is the historic WFD accident rate (A) (accidents by affected fleet divided by landings by the fleet) multiplied by landings (L) in year (t) multiplied by the two costs avoided plus the probability (P) of detecting a WFD problem during normal maintenance multiplied by the costs of unexpected groundings.

The annual benefits of the WFD regulation can be separated into two groups:

1. Accident-Related Benefits: The accident-related benefits relate to the estimated costs of accidents that would otherwise occur in the absence of the regulation. These estimated benefits include both the direct costs of the accident and the costs of inspecting and modifying the type of fuselages that were involved in the accident.

2. Detection-Related Benefits: The detection benefits relate to costs incurred by operators when they find WFD problems during the course of their normal maintenance operations; in such cases, the operators will need to develop an inspection and modification program for their fleet.

Both the accident related and detection related benefits are developed stochastically. The accident related benefits depend importantly upon the accident rate and the number of landings by fuselage types during each year of the analysis. Accidents are assumed to be rare events whose behavior is governed by the Poisson distribution. The present value of the mean accident-related benefits is $653.5 million. In FAA's analysis/simulation, there are on average 6.4 WFD related accidents over the 20-year analysis period. Between three and ten accidents occur in approximately 80 percent of the simulations. Zero accidents occur less than one percent of the time. The range of accident-related benefits is from 15 million to $1.5 billion in year 2000 dollars. The median value is **$633.8 million**, which is close to the mean.

The detection related benefits also are produced stochastically. Because WFD problems will occur as airplanes operate beyond their limit of validity, operators are likely to detect such problems over the 20-year forecast period. It has been assumed that there is a probability of finding WFD problems in each model type of five percent in each year. Under this assumption, there is a 35 percent chance that there will be zero WFD problems detected for a particular model type over a 20-year period. The detection behavior is characterized by the binomial distribution, so that in any given year there is either a WFD problem detected or there is not for each model type. Once a WFD problem is detected, it is assumed that the operators will undertake an inspection and modification program. It is assumed that this inspection program will be approximately 35 percent of the cost of the inspection program that would be undertaken under regulation. The learning curve effects are assumed to apply to these inspections and modifications. Airplanes are assumed to be out of service for a average of 13 days to undertake all of the inspections and modifications, resulting in denial of service (flight cancellations) and loss of revenue costs.

The FAA's analysis/simulation revealed the mean detection benefit estimate as \$94.5 million in year 2000 dollars. This ranges from a minimum of \$1.75 million to a maximum of \$175 million. Eighty percent of the time the detection benefits range between \$37.8 and \$116.4 million in year 2000 dollars.

The benefits of this proposal consist of accident prevention and the prevention of unscheduled maintenance and groundings of fleets of aircraft. The present value total benefits of this proposal are estimated to be **\$728.0 million.**

Costs

The costs of the WFD program include the following:

- The regulatory costs of establishing the rule;
- The costs to manufacturers or other third parties of developing inspection and modification programs to satisfy the rule; it is assumed that these costs are passed forward to operators;
- The direct cost to operators of performing inspections and modifications/replacement actions required under the rule;
- The cost of early retirement of airplanes in the event that airlines find it more cost effective to retire airplanes than to inspect/modify or replace structure.

It should be noted that the attributable costs of the regulation do not include the expense of making modifications or major repairs to structure that has been found to be cracked during inspections mandated by the rule. While these modifications or repairs may represent a significant direct expense, their costs are not attributable to the proposed rule because existing FAA regulations require that repairs be made when they are found to be necessary to ensure the continued airworthiness of the airplane. However, modifications that may be required to raise the limit of validity (LOV) for the current maintenance program —i.e., those assumed to be required to be made for an airplane to reach 125% of LOV are properly assigned to the rule costs.

It is assumed that the rule will become effective in the year 2004. In that year, approximately 163 airplanes would be subject to the rule. Their operators will be presented with the choice either to undertake an inspection and modification/replacement program or to retire the airplanes. In the analysis, the operators are assumed to select the lower cost alternative. So, for example, in the first year when the rule is assumed to become effective, 136 airplanes would be retired or inspected at a cost of $34.2 million. In that same year, 27 airplanes would be retired or modified at a cost of $36.1 million. (All dollar figures are in discounted year 2000 dollars.) Exposure data and cost estimates are provided for each year.

The total discounted present value costs of the inspection and structural modifications that would be required by the proposed WFD regulation are estimated to be **$358.1 million.**

Benefit/Cost Comparison

The $728.0 million benefits of this proposed rule exceed the estimated costs of the proposed rule of $358.1 million. Therefore, the FAA considers this proposal to be cost-justified.

Initial Regulatory Flexibility Determination

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

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

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

Under the RFA, the FAA must determine whether or not a proposed rule significantly affects a substantial number of small entities. This determination is typically based on small entity size and cost thresholds that vary depending on the affected industry. The FAA has conducted the required review and determined that this proposed rule would have a significant impact on a substantial number of small entities. Accordingly, a regulatory analysis was conducted as required by the RFA, and is summarized in this section.

The FAA has analyzed the effects of this proposal on small entities. It appears that this proposal would have a significant effect on a significant number (XX) of small entities.

Entities potentially affected by the proposed rule include:

[(to be completed by APO)]

The FAA has attempted to mitigate the impacts on these firms by considering alternatives, such as extending the compliance deadline for small entities. The alternatives are discussed in the full initial regulatory evaluation associated with this rule.

International Trade Impact Assessment

The Trade Agreement Act of 1979 prohibits Federal agencies from engaging in any standards or related activity that create unnecessary obstacles to the foreign commerce of the United States. Legitimate domestic objectives, such as safety, are not considered unnecessary obstacles. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards. In addition, consistent with the Administration's belief in the general superiority and desirability of free trade, it is the policy of the Administration to remove or diminish, to the extent feasible, barriers to international trade, including barriers affecting the export of American goods and services to foreign countries and barriers affecting the import of foreign goods and services into the United States.

In accordance with the above statute and policy, the FAA has assessed the potential effect of this proposed rule and has determined that it does not have an effect on international trade.

Unfunded Mandates Assessment

The Unfunded Mandates Reform Act of 1995 (2 U.S.C. 1532-1538) is intended, among other things, to curb the practice of imposing unfunded Federal mandates on State, local and tribal governments. It requires each Federal agency to prepare a written statement assessing the effects of any Federal mandate in a proposed or final agency rule that may result in a $100 million or more expenditure (adjusted annually for inflation) in any 1 year by State, local, and tribal governments, in the aggregate, or by the private sector; such a mandate is deemed to be a "significant regulatory action."

This proposed rule does not contain a Federal intergovernmental or private sector mandate that exceeds $100 million in any 1 year. Therefore, the requirements of the Unfunded Mandates Reform Act of 1995 do not apply.

Executive Order 13132, Federalism

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

Environmental Analysis

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

Energy Impact

The energy impact of the notice has been assessed in accordance with the Energy Policy and Conservation Act (EPCA) Pub. L. 94-163, as amended (42 U.S.C. 6362) and FAA Order 1053.1. It has been determined that the notice is not a major regulatory action under the provisions of the EPCA.

List of Subjects

14 CFR Part 91

Aircraft, Aviation Safety, Reporting and recordkeeping requirements

14 CFR Part 121

Air carriers, Aircraft, Aviation Safety, Reporting and recordkeeping requirements, Safety, Transportation

14 CFR Part 125

Aircraft, Aviation Safety, Reporting and recordkeeping requirements

14 CFR Part 129

Air carriers, Aircraft, Aviation Safety, Reporting and recordkeeping requirements

14 CFR Part 135

Aircraft, Aviation safety, Reporting and recordkeeping requirements

The Proposed Amendment

In consideration of the foregoing, the Federal Aviation Administration proposes to amend parts 91, 121, 125, 129, and 135 of Title 14, Code of Federal Regulations, as follows:

PART 91 - GENERAL OPERATING AND FLIGHT RULES

1. The authority citation for part 91 continues to read:

Authority: 49 U.S.C. 106(g), 40103, 40113, 40120, 44101, 44111, 44701, 44709, 44711, 44712, 44715, 44716, 44717, 44722, 46306, 46315, 46316, 46502, 46504, 46506-46507, 47122, 47508, 47528-47531.

2. Add § 91.4XX as follows:

§ 91.4XX Basis of Structural Maintenance Program.

No person may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), beyond [one year after the effective date of the amendment], unless Instructions for Continued Airworthiness (ICA), developed in accordance with Appendix H of part 25, are incorporated within its inspection program. The ICA must contain a section titled Airworthiness Limitations (ALS) that is segregated and clearly distinguishable from the rest of the document. The ALS must be approved by the FAA Aircraft Certification Office (ACO), or office of the Transport Airplane Directorate (TAD), having cognizance over the type certificate for the affected airplane. The ALS must contain either (a) or (b):

(a) For each airplane that has a certification basis that does include a requirement for damage-tolerance based inspections and procedures, this section must set forth each mandatory replacement time, structural inspection interval and related structural inspection procedure approved under § 25.571, which includes a structural maintenance program that includes a corrosion prevention and control program, repair assessment program and a mandatory modifications program and with a stated limit of validity in flight cycles or flight hours.

(b) For each airplane that has a certification basis that does not include a requirement for damage-tolerance based inspections and procedures, this section must include the supplemental structural inspection program, corrosion prevention and control program, repair assessment program and mandatory modifications program and include a structural maintenance program with a stated limit of validity in flight cycles or flight hours.

3. Add § 91.4YY as follows:

§ 91.4YY Aging Aircraft Program (Widespread Fatigue Damage).

(a) No person may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), beyond the flight cycle limits shown in its Airworthiness Limitations section (ALS) of the Instructions for Continued Airworthiness (ICA), or [a date one year after the effective date of the amendment], whichever occurs later, unless a structural maintenance program is incorporated within its inspection program. This new program must include inspections and modification/replacement actions to the baseline structure for prevention of WFD. The baseline structure is defined as that airplane structure that was originally built by the TCH. The new structural maintenance program will be limited by flight cycles or flight hours, which must be specified in the ALS of the ICA that has been approved by the FAA Aircraft Certification Office (ACO) or office of the Transport Airplane Directorate (TAD), having cognizance over the type certificate for the affected airplane. Any subsequent changes to the structural maintenance program must also be approved by the FAA ACO or office of the

TAD, having cognizance over the type certificate for the affected airplane before they can be incorporated within the operator's inspection program.

(b) No person may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), 48 months after initial incorporation per paragraph (a), or 48 months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its Airworthiness Limitations section (ALS) of the Instructions for Continued Airworthiness (ICA), whichever occurs later, unless a structural maintenance program is incorporated within its inspection program. This new program must include inspections and modification/replacement actions to repairs, alterations or modifications susceptible to MSD or MED or repairs, alterations or modifications that affect the baseline structure that is susceptible to MSD or MED accomplished prior to the effective date of this proposed rule, for prevention of WFD. The new structural maintenance program must be approved by the FAA ACO or office of the TAD, having cognizance over the type certificate for the affected airplane. The following requirements are to be accomplished at the times noted below:

(1) Within six months after initial incorporation per paragraph (a) or within six months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its ALS of the ICA, whichever occurs later, each operator establishes a plan to address repairs, alterations and modifications, which includes identification of interim inspections of applicable repairs, alterations and modifications. Each operator submits that plan to the FAA ACO or office of the TAD through the operator's PMI.

(2) Within six months after receipt of the plan, the FAA ACO or office of the TAD approves the plan if it is acceptable.

(3) Within six months after receipt of the FAA approved plan, each operator incorporates interim inspections of applicable repairs, alterations, and modifications identified in the plan.

(4) Within 36 months after initial incorporation per paragraph (a) or within 36 months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its ALS of the ICA, whichever occurs later, each operator submits a structural maintenance program to the FAA ACO or office of the TAD through the operator's PMI.

(5) Within six months after receipt of the structural maintenance program, the FAA ACO or office of the TAD approves the program if it is acceptable.

(6) Within 48 months after initial incorporation per paragraph (a) or within 48 months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its ALS of the ICA, whichever occurs later, each operator incorporates the FAA approved structural maintenance program into its maintenance or inspection program.

(c) No person may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), 18 months after a repair, alteration or modification susceptible to MSD or MED or a repair, alteration or modification that affects the baseline structure that is susceptible to MSD or MED is accomplished on or after the effective date of the rule, unless a structural maintenance program is incorporated within its inspection program. This new program must include a threshold where inspections and/or modification/replacement actions to said repair, alteration, or modification must be incorporated to preclude WFD. The new structural maintenance program must be approved by the FAA ACO or office of the TAD, having cognizance over the type certificate for the affected airplane. The following requirements are to be accomplished at the times noted below:

(1) The static strength approval of the repair, alteration, or modification is to be accomplished before further flight.

(2) Within 18 months of the static strength approval, a damage tolerance analysis that includes a WFD analysis of the repair, alteration or modification is approved by the FAA ACO or office of the TAD, which defines the threshold for inspections and/or modification/replacement actions.

(3) Within 24 months before reaching the threshold, specific FAA approved inspection methods and repeat intervals are incorporated for each repair, alteration or modification into the FAA approved structural maintenance program.

PART 121 - CERTIFICATION AND OPERATIONS: DOMESTIC, FLAG, AND SUPPLEMENTAL AIR CARRIERS AND COMMERCIAL OPERATORS OF LARGE AIRCRAFT.

4. The authority citation for part 121 continues to read:

Authority: 49 U.S.C. 106(g), 40113, 40119, 44101, 44701-44702, 44705, 44709-44711, 44713, 44716-44717, 44722, 44901, 44903-44904, 44912, 46105.

5. Add § 121.3XX as follows:

§ 121.3XX Basis of Structural Maintenance Program.

No certificate holder may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), beyond [one year after the effective date of the amendment], unless Instructions for Continued Airworthiness (ICA), developed in accordance with Appendix H of part 25, are incorporated within its maintenance program. The ICA must contain a section title Airworthiness Limitations (ALS) that is segregated and clearly distinguishable from the rest of the document. The ALS must be approved by the FAA Aircraft Certification Office (ACO), or office of the Transport Airplane Directorate (TAD), having cognizance over the type certificate for the affected airplane. The ALS must contain either (a) or (b):

(a) For each airplane that has a certification basis that does include a requirement for damage-tolerance based inspections and procedures, this section must set forth each mandatory replacement time, structural inspection interval and related structural inspection procedure approved under § 25.571, which includes a structural maintenance program that includes a corrosion prevention and control program, repair assessment program and mandatory modifications program and with a stated limit of validity in flight cycles or flight hours.

(b) For each airplane that has a certification basis that does not include a requirement for damage-tolerance based inspections and procedures, this section must include the supplemental structural inspection program, corrosion prevention and control program, repair assessment program and mandatory modifications program and include a structural maintenance program with a stated limit of validity in flight cycles or flight hours.

6. Add § 121.3YY as follows:

§ 121.3YY Aging Aircraft Program (Widespread Fatigue Damage).

(a) No certificate holder may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), beyond the flight cycle limits shown in its Airworthiness Limitations section (ALS) of the Instructions for Continued Airworthiness (ICA), or [a date one year after the effective date of the amendment], whichever occurs later, unless a structural maintenance program is incorporated within its maintenance program. This new program must include inspections and modification/replacement actions to the baseline structure for prevention of WFD. The baseline structure is defined as that airplane structure that was originally built by the TCH. The new structural maintenance program will be limited by flight cycles or flight hours, which must be specified in the ALSof the ICAthat has been approved by the FAA Aircraft Certification Office (ACO) or office of the Transport Airplane Directorate (TAD), having cognizance over the type certificate for the affected airplane. Any subsequent changes to the structural maintenance program must also be approved by the FAA ACO or office of the TAD, having cognizance over the type certificate for the affected airplane before they can be incorporated within the operator's maintenance program.

(b) No certificate holder may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), 48 months after initial incorporation per paragraph (a), or 48 months beyond the time that the airplane has accumulated the flight cycles flight hours shown in the limit of validity manifested in its Airworthiness Limitations section (ALS) of the Instructions for Continued Airworthiness (ICA), whichever occurs later, unless a structural maintenance program is incorporated within its maintenance program. This new program must include inspections and modification/replacement actions to repairs, alterations or modifications to susceptible to MSD or MED or repairs, alterations or modifications that affect the baseline structure that is susceptible to MSD or MED accomplished prior to the effective date of this proposed rule, for prevention of WFD. The new structural maintenance program must be approved by the FAA ACO or office of the TAD, having cognizance over the type certificate for the affected airplane. The following requirements are to be accomplished at the times noted below:

(1) Within six months after initial incorporation per paragraph (a) or within six months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its ALS of the ICA, whichever occurs later, each operator establishes a plan to address repairs, alterations and modifications, which includes identification of interim inspections of applicable repairs, alterations and modifications. Each operator submits that plan to the FAA ACO or office of the TAD through the operator's PMI.

(2) Within six months after receipt of the plan, the FAA ACO or office of the TAD approves the plan if it is acceptable.

(3) Within six months after receipt of the FAA approved plan, each operator incorporates interim inspections of applicable repairs, alterations, and modifications identified in the plan.

(4) Within 36 months after initial incorporation per paragraph (a) or within 36 months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its ALS of the ICA, whichever occurs later, each operator submits the structural maintenance program to the FAA ACO or office of the TAD through the operator's PMI.

(5) Within six months after receipt of the structural maintenance program, the FAA ACO or office of the TAD approves the program if it is acceptable.

(6) Within 48 months after initial incorporation per paragraph (a) or within 48 months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its ALS of the ICA, whichever occurs later, each operator incorporates the FAA approved program into its maintenance program.

(c) No certificate holder may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), 18 months after a repair, alteration or modification susceptible to MSD or MED or a repair, alteration or modification that affects baseline structure that is susceptible to MSD or MED is accomplished on or after the effective date of the rule, unless a structural maintenance program is incorporated within its maintenance program. This new program must include a threshold where inspections and modification/replacement actions to said repair, alteration, or modification must be incorporated to preclude WFD. The new structural maintenance program must be approved by the FAA ACO or office of the TAD, having cognizance over the type certificate for the affected airplane. The following requirements are to be accomplished at the times noted below:

(1) The static strength approval of the repair, alteration, or modification is to be accomplished before further flight.

(2) Within 18 months of the static strength approval, a damage-tolerance analysis that includes a WFD analysis of the repair, alteration or modification is approved by the FAA ACO or office of the TAD, which defines the threshold for inspections and/or modification/replacement actions.

(3) Within 24 months before reaching the threshold, specific FAA approved inspection methods and repeat intervals are incorporated for each repair, alteration or modification into the FAA approved structural maintenance program.

PART 125 - CERTIFICATION AND OPERATIONS: AIRPLANES HAVING A SEATING CAPACITY OF 20 OR MORE PASSENGERS OR A MAXIMUM PAYLOAD CAPACITY OF 6,000 POUNDS OR MORE

7. The authority citation for part 125 continues to read:

Authority: 49 U.S.C. 106(g), 40113, 44701-44702, 44705, 44710-44711, 44713, 44716-44717, 44722.

8. Add § 125.2XX as follows:

§ 125.2XX Basis of Structural Maintenance Program.

No person may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), beyond [one year after the effective date of the amendment], unless Instructions for Continued Airworthiness (ICA), developed in accordance with Appendix H of part 25, are incorporated within its maintenance program. The ICA must contain a section titled Airworthiness Limitations (ALS) that is segregated and clearly distinguishable from the rest of the document. The ALS must be approved by the FAA Aircraft Certification Office (ACO), or office of the Transport Airplane Directorate (TAD), having cognizance over the type certificate for the affected airplane. The ALS must contain either (a) or (b):

(a) For each airplane that has a certification basis that does include a requirement for damage-tolerance based inspections and procedures, this section must set forth each mandatory replacement time, structural inspection interval and related structural inspection procedure approved under § 25.571, which includes a structural maintenance program that includes a corrosion prevention and control program, repair assessment program and mandatory modifications program and with a stated limit of validity in flight cycles or flight hours.

(b) For each airplane that has a certification basis that does not include a requirement for damage-tolerance based inspections and procedures, this section must include the supplemental structural inspection program, corrosion prevention and control program, repair assessment program and mandatory modifications program with a stated limit of validity in flight cycles or flight hours.

9. Add § 125.2YY as follows:

§ 125.2YY Aging Aircraft Program (Widespread Fatigue Damage).

(a) No person may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), beyond the flight cycle limits shown in its Airworthiness Limitations section (ALS) of the Instructions for Continued Airworthiness (ICA), or [a date one year after the effective date of the amendment], whichever occurs later, unless a structural maintenance program is incorporated within its maintenance program. This new program must include inspections and modification/replacement actions to the baseline structure for prevention of WFD. The baseline structure is defined as that airplane structure that was originally built by the TCH. The new structural maintenance program will be limited by flight cycles or flight hours, which must be specified in the ALS of the ICA that has been approved by the FAA Aircraft Certification Office (ACO) or office of the Transport Airplane Directorate (TAD), having cognizance over the type certificate for the affected airplane. Any subsequent changes to the structural maintenance program must also be approved by the FAA ACO or office of the TAD, having cognizance over the type certificate for the affected airplane before they can be incorporated within the operator's maintenance program.

(b) No person may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), 48 months after initial incorporation per paragraph (a), or 48 months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its Airworthiness Limitations section (ALS) of the Instructions for Continued Airworthiness (ICA), whichever occurs later, unless a structural maintenance program is incorporated within its maintenance program. This new program must includeinspections and modification/replacement actions to repairs, alterations or modifications susceptible to MSD or MED or repairs, alterations or modifications that affect baseline structure that is susceptible to MSD or MED accomplished prior to the effective date of this proposed rule, for prevention of WFD. The new structural maintenance program must be approved by the FAA ACO or office of the TAD, having cognizance over the type certificate for the affected airplane. The following requirements are to be accomplished at the times noted below:

(1) Within six months after initial incorporation per paragraph (a) or within six months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its ALS of the ICA, whichever occurs later, each operator establishes a plan to address repairs, alterations and modifications, which includes identification of interim inspections of applicable repairs, alterations and modifications. Each operator submits that plan to the FAA ACO or office of the TAD through the operator's PMI.

(2) Within six months after receipt of the plan, the FAA ACO or office of the TAD approves the plan if it is acceptable.

(3) Within six months after receipt of the FAA approved plan, each operator incorporates interim inspections of applicable repairs, alterations, and modifications identified in the plan.

(4) Within 36 months after initial incorporation per paragraph (a) or within 36 months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its ALS of the ICA, whichever occurs later, each operator submits a structural maintenance program to the FAA ACO or office of the TAD through the operator's PMI.

(5) Within six months after receipt of the structural maintenance program, the FAA ACO or office of the TAD approves the program if it is acceptable.

(6) Within 48 months after initial incorporation per paragraph (a) or within 48 months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its ALS of the ICA, whichever occurs later, each operator incorporates the FAA approved structural maintenance program into its maintenance program.

(c) No person may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), 18 months after a repair, alteration or modification susceptible to MSD or MED or a repair, alteration or modification that affects the baseline structure that is susceptible to MSD or MED is accomplished on or after the effective date of the rule, unless a structural maintenance program is incorporated within its maintenance program. This new program must include a threshold where inspections and/or modification/replacement actions to said repair, alteration, or modification must be incorporated to preclude WFD. The new structural maintenance program must be approved by the FAA ACO or office of the TAD, having cognizance over the type certificate for the affected airplane. The following requirements are to be accomplished at the times noted below:

(1) The static strength approval of the repair, alteration, or modification is to be accomplished before further flight.

(2) Within 18 months of the static strength approval, a DTA analysis that includes a WFD analysis of the repair, alteration or modification is approved by the FAA

ACO or office of the TAD, which defines the threshold for inspections and/or modification/replacement actions.

(3) Within 24 months before reaching the threshold, specific FAA approved inspection methods and repeat intervals are incorporated for each repair. Alteration or modification into the FAA approved structural maintenance program.

PART 129 - OPERATIONS: FOREIGN AIR CARRIERS AND FOREIGN OPERATORS OF U.S.-REGISTERED AIRCRAFT ENGAGED IN COMMON CARRIAGE

10. The authority citation for part 129 continues to read:

Authority: 49 U.S.C. 106(g), 40104-40105, 40113, 40119, 44701-44702, 44712, 44716-44717, 44722, 44901-44904, 44906.

11. Add § 129.3X as follows:

§ 129.3X Basis of Structural Maintenance Program.

No foreign air carrier or foreign persons operating a U.S. registered airplane may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), beyond [one year after the effective date of the amendment], unless Instructions for Continued Airworthiness (ICA), developed in accordance with Appendix H of part 25, are incorporated within its maintenance program. The ICA must contain a section titled Airworthiness Limitations (ALS) that is segregated and clearly distinguishable from the rest of the document. The ALS must be approved by the FAA Aircraft Certification Office (ACO), or office of the Transport Airplane Directorate (TAD), having cognizance over the type certificate for the affected airplane. The ALS must contain either (a) or (b):

(a) For each airplane that has a certification basis that does include a requirement for damage-tolerance based inspections and procedures, this section must set forth each mandatory replacement time, structural inspection interval and related structural inspection procedure approved under § 25.571, which includes a structural maintenance program that includes a corrosion prevention and control program, repair assessment program and mandatory modifications program and with a stated limit of validity in flight cycles or flight hours.

(b) For each airplane that has a certification basis that does not include a requirement for damage tolerance based inspections and procedures, this section must include the supplemental structural inspection program, corrosion prevention and control program, repair assessment program and mandatory modifications program with a stated limit of validity in flight cycles or flight hours.

12. Add § 129.3Y as follows:

§ 129.3Y Aging Aircraft Program (Widespread Fatigue Damage)

(a) No foreign air carrier or foreign persons operating a U.S. registered airplane may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), beyond the flight cycle limits shown in its Airworthiness Limitations section (ALS) of the Instructions for Continued Airworthiness (ICA), or [a date one year after the effective date of the amendment], whichever occurs later, unless a structural maintenance program is incorporated within its maintenance program. This new program must include inspections and modification/replacement actions to the baseline structure for prevention of WFD. The baseline structure is defined as that airplane structure that was originally built by the TCH. The new structural maintenance program will be limited by flight cycles or flight hours, which must be specified in the ALS of the ICA that has been approved by the FAA Aircraft Certification Office (ACO) or office of the Transport Airplane Directorate (TAD), having cognizance over the type certificate for the affected airplane. Any subsequent changes to the structural maintenance program must also be approved by the FAA ACO or office of the TAD, having cognizance over the type certificate for the affected airplane before they can be incorporated within the operator's maintenance program.

(b) No foreign air carrier or foreign persons operating a U.S. registered airplane may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), 48 months after initial incorporation per paragraph (a), or 48 months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its Airworthiness Limitations section (ALS) of the Instructions for Continued Airworthiness (ICA), whichever occurs later, unless a structural maintenance program is incorporated within its maintenance program. This new program must include inspections and modification/replacement actions to repairs, alterations or modifications susceptible to MSD or MED or repairs, alterations or modifications that affect baseline structure that is susceptible to MSD or MED accomplished prior to the effective date of this proposed rule, for prevention of WFD. The new structural maintenance program must be approved by the FAA ACO or office of the TAD, having cognizance over the type certificate for the affected airplane. The following requirements are to be accomplished at the times noted below:

(1) Within six months after initial incorporation per paragraph (a) or within six months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its ALS of the ICA, whichever occurs later, each operator establishes a plan to address repairs, alterations and modifications, which includes identification of interim inspections of applicable repairs, alterations and modifications. Each operator submits that plan to the FAA ACO or office of the TAD through the operator's PMI.

(2) Within six months after receipt of the plan, the FAA ACO or office of the TAD approves the plan if it is acceptable.

(3) Within six months after receipt of the FAA approved plan, each operator incorporate interim inspections of applicable repairs, alterations and modifications identified in the plan.

(4) Within 36 months after initial incorporation per paragraph (a) or within 36 months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its ALS of the ICA, whichever occurs later, each operator submits the structural maintenance program to the FAA ACO or office of the TAD through the operator's PMI.

(5) Within six months after receipt of the structural maintenance program, the FAA ACO or office of the TAD approves the program if it is acceptable.

(6) Within 48 months after initial incorporation per paragraph (a) or within 48 months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its ALS of the ICA, whichever occurs later, each operator incorporates the FAA approved structural maintenance program into its maintenance program.

(c) No foreign air carrier or foreign persons operating a U.S. registered airplane may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), 18 months after a repair, alteration or modification susceptible to MSD or MED or a repair, alteration or modification that affects baseline structure that is susceptible to MSD or MED is accomplished on or after the effective date of the rule, unless a structural maintenance program is incorporated within its maintenance program. This new program must include a threshold where inspections and/or modification/replacement actions to said repair, alteration, or modification must be incorporated to preclude WFD. The new structural maintenance program must be approved by the FAA ACO or office of the TAD, having cognizance over the type certificate for the affected airplane. The following requirements are to be accomplished at the times noted below:

(1) The static strength approval of the repair, alteration, or modification is to be accomplished before further flight.

(2) Within 18 months of the static strength approval, a damage-tolerance analysis that includes a WFD analysis of the repair, alteration or modification is approved by the FAA ACO or office of the TAD, which defines the threshold for inspections and/or modification/replacement actions.

(6) Within 24 months before reaching the threshold, specific FAA approved inspection methods and repeat intervals are incorporated for each repair, alteration or modification into the FAA approved structural maintenance program.

PART 135 – OPERATING REQUIREMENTS: COMMUTER AND ON-DEMAND OPERATIONS.

13. The authority citation for part 135 continues to read:

Authority: 49 U.S.C. 106(g), 44113, 44701-44702, 44705, 44709, 44711-44713, 44715-44717, 44722.

14. Add § 135.4XX as follows:

§ 135.4XX Basis of Structural Maintenance Program.

No certificate holder may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), beyond [one year after the effective date of the amendment], unless Instructions for Continued Airworthiness (ICA), developed in accordance with Appendix H of part 25, are incorporated within its maintenance program. The ICA must contain a section titled Airworthiness Limitations (ALS) that is segregated and clearly distinguishable from the rest of the document. The ALS must be approved by the FAA Aircraft Certification Office (ACO, or office of the Transport Airplane Directorate (TAD), having cognizance over the type certificate for the affected airplane. The ALS must contain either (a) or (b):

(a) For each airplane that has a certification basis that does include a requirement for damage-tolerance based inspections and procedures, this section must set forth each mandatory replacement time, structural inspection interval and related structural inspection procedure approved under § 25.571, which includes a structural maintenance program that includes a corrosion prevention and control program, repair assessment program, and mandatory modifications program and with a stated limit of validity in flight cycles or flight hours.

(b) For each airplane that has a certification basis that does not include a requirement for damage-tolerance based inspections and procedures, this section must include the supplemental structural inspection program, corrosion prevention and control program, repair assessment program and mandatory modifications program with a stated limit of validity in flight cycles or flight hours.

15. Add § 135.4YY as follows:

§ 135.4YY Aging Aircraft Program (Widespread Fatigue Damage).

(a) No certificate holder may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), beyond the flight cycle limits shown in its Airworthiness Limitations section (ALS) of the Instructions for Continued Airworthiness (ICA), or [a date one year after the effective date of the amendment], whichever occurs later, unless a structural maintenance program is incorporated within its inspection program. This new program must include inspections and modification/replacement actions to the baseline structure for prevention of WFD. The baseline structure is defined as that airplane structure that was originally built by the TCH. The new structural maintenance program will be limited by flight cycles or flight hours, which must be specified in the ALSof the ICAthat has been approved by the FAA Aircraft Certification Office (ACO) or office of the Transport Airplane Directorate (TAD), having cognizance over the type certificate for the affected airplane. Any subsequent changes to the structural maintenance program must also be approved by the FAA ACO or office of the TAD, having cognizance over the type certificate for the affected airplane before they can be incorporated within the operator's maintenance program.

(b) No certificate holder may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), 48 months after initial incorporation per paragraph (a) or 48 months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its Airworthiness Limitations section (ALS) of the Instructions for Continued Airworthiness (ICA), whichever occurs later, unless a structural maintenance program is incorporated within its maintenance program. This new program must include inspections and modification/replacement actions to repairs, alterations or modifications susceptible to MSD or MED or repairs, alterations or modifications that affect the baseline structure that is susceptible to MSD or MED accomplished prior to the effective date of this proposed rule, for prevention of WFD. The new structural maintenance program must be approved by the FAA ACO or office of the TAD, having cognizance over the type certificate for the affected airplane. The following requirements are to be accomplished at the times noted below:

(1) Within six months after initial incorporation per paragraph (a) or within six months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its ALS of the ICA, whichever occurs later, each operator establishes a plan to address repairs, alterations and modifications, which includes identification of interim inspections of applicable repairs, alterations and modifications. Each operator submits that plan to the FAA ACO or office of the TAD through the operator's PMI.

(2) Within six months after receipt of the plan, the FAA ACO or office of the TAD approves the plan if it is acceptable.

(3) Within six months after receipt of the FAA approved plan, each operator incorporates interim inspections of applicable repairs, alterations, and modifications identified in the plan.

(4) Within 36 months after initial incorporation per paragraph (a) or within 36 months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its ALS of the ICA, whichever occurs later, each operator submits the structural maintenance program to the FAA ACO or office of the TAD through the operator's PMI.

(5) Within six months after receipt of the structural maintenance program, the FAA ACO or office of the TAD approves the program if it is acceptable.

(6) Within 48 months after initial incorporation per paragraph (a) or within 48 months beyond the time that the airplane has accumulated the flight cycles or flight hours shown in the limit of validity manifested in its ALS of the ICA, whichever occurs later, each operator incorporates the FAA approved structural maintenance program into its maintenance program.

(c) No certificate holder may operate a transport category airplane, greater than 75,000 pounds (maximum takeoff gross weight), 18 months after a repair, alteration or modification susceptible to MSD or MED or a repair, alteration or modification that affects baseline structure that is susceptible to MSD or MED is accomplished on or after the effective date of the rule, unless a structural maintenance program is incorporated within its maintenance program. This new program must include a threshold where inspections and/or modification/replacement actions to said repair, alteration, or modification must be incorporated to preclude WFD. The new structural maintenance program must be approved by the FAA ACO or office of the TAD, having cognizance over the type certificate for the affected airplane. The following requirements are to be accomplished at the times noted below:

(1) The static strength approval of the repair, alteration, or modification is to be accomplished before further flight.

(2) Within 18 months of the static strength approval, a damage-tolerance analysis that includes a WFD analysis of the repair, alteration or modification is approved by the

FAA ACO or office of the TAD, which defines the threshold for inspections and/or modification/replacement actions.

(3) Prior to 24 months before reaching the threshold, specific FAA approved inspection methods and repeat intervals are incorporated for each repair, alteration or modification into the FAA approved structural maintenance program.

Issued in Washington, D.C. on

Aircraft Certification Service

U.S. Department
of Transportation

**Federal Aviation
Administration**

Advisory Circular

Subject: CONTINUING STRUCTURAL INTEGRITY PROGRAM FOR LARGE TRANSPORT CATEGORY AIRPLANES

Date: 4/29/98

Initiated by: ANM-115

AC No: 91-56A

Change:

1. PURPOSE. This Advisory Circular (AC) provides guidance material to manufacturers and operators of transport category airplanes for use in developing a continuing structural integrity program to ensure safe operation of older airplanes throughout their operational life. This guidance material applies to large transport airplanes which were certified under the fail-safe and fatigue requirements of Civil Air Regulations (CAR) 4b or 14 CFR part 25 of the Federal Aviation Regulations (FAR), prior to Amendment 25-45, and which have a maximum gross weight greater than 75,000 pounds. Guidance material on this subject for other transports is provided in AC 91-60. The procedures set forth by this AC are applicable to the large transport category airplanes operated under Subpart D of part 91, and parts 121 and 125.

2. CANCELLATION. Advisory Circular AC 91-56, Supplemental Structural Inspection Program for Large Transport Category Airplanes, dated May 6, 1981, is canceled.

3. RELATED FAR SECTIONS. Section 25.571 of part 25, as amended by Amdts. 25-45, 25-54, and 25-72; § 91.403 of part 91; and § 43.16 of part 43.

4. RELATED ADVISORY CIRCULARS. Advisory Circular 91-60, "The Continued Airworthiness of Older Airplanes," dated June 13, 1983.

5. BACKGROUND. Service experience has demonstrated that there is a need to have continuing updated knowledge concerning the structural integrity of transport airplanes, especially as they became older. The structural integrity of these airplanes is of concern since such factors as fatigue cracking and corrosion are time dependent and knowledge concerning them can best be assessed on the basis of real time operational experience and the use of the most modern tools of analysis and testing.

The Federal Aviation Administration (FAA), manufacturers, and operators have continually worked to maintain the structural integrity of older airplanes. Traditionally, this has been accomplished through an exchange of field service information and subsequent changes to inspection programs, and by the development and installation of modifications on particular aircraft. However, increased utilization, longer operational lives, and the high safety demands imposed on the current fleet of transport airplanes indicate the need for a program to ensure a high level of structural integrity for all airplanes in the transport fleet. Accordingly, the inspection and evaluation programs outlined in this advisory circular are intended to ensure a continuing structural integrity assessment by each airplane manufacturer and the incorporation of the results of each assessment into the maintenance program of each operator.

6. SUPPLEMENTAL STRUCTURAL INSPECTION PROGRAMS. The manufacturer, in conjunction with operators, is expected to initiate development of a supplemental structural inspection program for each airplane model. Such a program must be implemented before analysis, tests, and/or service experience indicates that a significant increase in inspection and/or modification is necessary to maintain structural integrity of the airplane. In the absence of other data as a guideline, the program should be initiated no later than the time when the high-time or high-cycle airplane in the fleet reaches one half its design service goal. This should ensure that an acceptable program is available to the operators when needed. The program should include procedures for obtaining service information, and assessment of service information, available test data, and new analysis and test data. A Supplemental Inspection Document (SID) should be developed, as outlined in Appendix 1 of this AC, from this body of data.

a. The recommended supplemental inspection program, along with the criteria used and the basis for the criteria, should be submitted to the cognizant FAA Aircraft Certification Office for review and approval. The supplemental program should be adequately defined in the SID and presented in a manner that is effective. The SID should include the type of damage being considered, and likely sites; inspection access, threshold, interval, method and procedures; applicable modification status and/or life limitation; and types of operations for which the SID is valid.

b. The FAA review of the SID will include both engineering and maintenance aspects of the proposal. Since the SID is applicable to all operators and is a safety concern for older airplanes, it will be made mandatory under the existing Airworthiness Directive (AD) system. In addition, any service bulletin or other service information publications found to be essential for safety during the initial SID assessment process should be implemented by AD action. Service bulletins or other service information publications revised or issued as a result of in service findings resulting from implementation of the SID should be added to the SID or implemented by separate AD action, as appropriate.

c. In the event an acceptable SID cannot be obtained on a timely basis, the FAA may impose service life, operational, or inspection limitations to assure structural integrity.

d. The manufacturer should revise the SID whenever additional information shows a need. The original SID will normally be based on predictions or assumptions (from analyses, tests and/or service experience) of failure modes, time to initial damage, frequency of damage, typically detectable damage, and the damage growth period. Consequently, a change in these factors sufficient to justify a revision would have to be substantiated by test data or additional service information. Any revision to SID criteria and the basis for these revisions should be submitted to the FAA for review and approval of both engineering and maintenance aspects.

7. AGING AIRCRAFT MODIFICATION PROGRAM. [Reserved]

8. CORROSION PREVENTION AND CONTROL PROGRAM. [Reserved]

9. REPAIR EVALUATION PROGRAM. [Reserved]

10. EVALUATION FOR WIDESPREAD FATIGUE DAMAGE. The manufacturer, in conjunction with operators, is expected to initiate development of a Widespread Fatigue Damage (WFD) prediction and verification technique with the intent of precluding operation in the presence of WFD. Such a program must be implemented before analysis, tests, and/or service experience indicates that widespread fatigue damage may develop in the fleet. To ensure that an acceptable program is available to the operators when needed, development of the program should be initiated no later than the time when the high-time or high-cycle airplane in the fleet reaches three quarters of its design service goal.

a. The results of the WFD evaluation should be presented to the cognizant FAA Aircraft Certification Office for review and approval. Since the objective of this evaluation is to eliminate WFD from the fleet, it is expected that the results will include recommendations for the verification or removal of WFD as appropriate. In the case of verification inspections, the very small size of critical WFD cracks may dictate the use of new inspection techniques. It is expected that the manufacturer will work closely with operators to assure that the expertise and resources for such inspections are available when needed.

b. The FAA review of the WFD evaluation results will include both engineering and maintenance aspects of the proposal. Since WFD is applicable to all operators and is a demonstrated safety concern for older airplanes, identified inspection or modification programs will be made mandatory. In addition, any service bulletins or other service information publications revised or issued as a result of in-service WFD findings resulting from implementation of these programs may require separate AD action.

c. In the event an acceptable WFD evaluation is not completed on a timely basis, the FAA may impose service life, operational limitations, or inspection requirements to assure structural integrity.

d. The manufacturer should update the WFD evaluation as the fleet continues to age, and as additional information shows a need. It is expected that the original recommended actions stemming from a WFD evaluation will be focused on those structural items determined to be prone to WFD that have passed, or are soon expected to reach, the age at which WFD is predicted to occur. As the fleet ages, more areas of the airplane may reach that point, and the recommended actions should be updated accordingly. Also, new service experience findings, improvements in the prediction methodology, better load spectrum data, or a change in any of the factors upon which the WFD evaluation is based may dictate a revision to the evaluation. Accordingly, associated new recommendations for service action should be developed and submitted to the FAA for review and approval of both engineering and maintenance aspects.

11. IMPLEMENTATION. Once a SID AD is issued, operators will be in a position to amend their current structural inspection programs to comply with and account for the applicable AD. The same will be true for WFD AD's that require special inspections. WFD AD's that require structural modification would be handled separately. In all cases, compliance will be required in accordance with the applicable regulations.

Ronald T. Wojnar

Ronald T. Wojnar
Manager, Transport Airplane Directorate
Aircraft Certification Service

APPENDIX 1

GUIDELINES FOR DEVELOPMENT OF THE SUPPLEMENTAL INSPECTION DOCUMENT

1. GENERAL.

a. The transport airplanes subject to this appendix to AC 91-56A were certified prior to Amendment 25-45 of § 25.571, which emphasizes damage-tolerant design. However, the structure to be evaluated, the type of damage considered (fatigue, corrosion, service, and production damage), and the inspection and/or modification criteria should, to the extent practicable, be in accordance with the damage-tolerance principles of the current § 25.571 standards.

b. It is essential to identify the structural parts and components that contribute significantly to carrying flight, ground, pressure, or control loads, and whose failure could affect the structural integrity necessary for the continued safe operation of the airplane. The damage tolerance or safe-life characteristics of these parts and components must be established or confirmed.

c. Analyses made in respect to the continuing assessment of structural integrity should be based on supporting evidence, including test and service data. This supporting evidence should include consideration of the operating loading spectra, structural loading distributions, and material behavior. An appropriate allowance should be made for the scatter in life to crack initiation and rate of crack propagation in establishing the inspection threshold, inspection frequency, and, where appropriate, retirement life. Alternatively, an inspection threshold may be based solely on a statistical assessment of fleet experience, provided that it can be shown that equal confidence can be placed in such an approach.

d. An effective method of evaluating the structural condition of older airplanes is selective inspection with intensive use of nondestructive techniques and the inspection of individual airplanes, involving partial or complete dismantling ("tear-down") of available structure.

e. The effect of repairs and modifications approved by the manufacturer should be considered. In addition, it may be necessary to consider the effect of repairs and operator-approved modifications on individual airplanes. The operator has the responsibility for ensuring notification and consideration of any such aspects.

2. DAMAGE-TOLERANT STRUCTURES.

a. The damage tolerance assessment of the airplane structure should be based on the best information available. The assessment should include a review of analysis, test data, operational experience, and any special inspections related to the type design. A determination should then be made of the site or sites within each structural part or component considered likely to crack, and the time or number of flights at which this might occur.

b. The growth characteristics of damage and interactive effects on adjacent parts in promoting more rapid or extensive damage should be determined. This study should include those sites that may be subject to the possibility of crack initiation due to fatigue, corrosion, stress corrosion, disbonding, accidental damage, or manufacturing defects in those areas shown to be vulnerable by service experience or design judgment.

c. The minimum size of damage that it is practical to detect and the proposed method of inspection should be determined. This determination should take into account the number of flights required for the crack to grow from detectable to the allowable limit, such that the structure has a residual strength corresponding to the conditions stated for fail-safe qualification under § 25.571.

NOTE: In determining the proposed method of inspection, consideration should be given to visual inspection, nondestructive testing, and analysis of data from built-in load and defect monitoring devices.

d. The continuing assessment of structural integrity may involve more extensive damage than might have been considered in the original fail-safe evaluation of the airplane, such as:

(1) A number of small adjacent cracks, each of which may be less than the typically detectable length, developing suddenly into a long crack;

(2) Failures or partial failures in other locations following an initial failure due to redistribution of loading causing a more rapid spread of fatigue; and

(3) Concurrent failure or partial failure of multiple load path elements (e.g., lugs, planks, or crack arrest features) working at similar stress levels.

3. INFORMATION TO BE INCLUDED IN THE ASSESSMENT.

a. The continuing assessment of structural integrity for the particular airplane type should be based on the principles outlined in paragraph 2 of this appendix. The following information should be included in the assessment and kept by the manufacturer in a form available for reference:

(1) The current operational statistics of the fleet in terms of hours or flights:

(2) The typical operational mission, or missions assumed in the assessment;

(3) The structural loading conditions from the chosen missions; and

(4) Supporting test evidence and relevant service experience.

b. In addition to the information specified in paragraph 3a, the following should be included for each critical part or component:

(1) The basis employed for evaluating the damage tolerance characteristics of the part or component;

(2) The site or sites within the part or component where damage could affect the structural integrity of the airplane;

(3) The recommended inspection methods for the area;

(4) For damage tolerant structures, the maximum damage size at which the residual strength capability can be demonstrated and the critical design loading case for the latter; and

(5) For damage tolerant structures, at each damage site the inspection threshold and the damage growth interval between detectable and critical, including any likely interaction effects from other damage sites.

Note: Where reevaluation of fail-safety or damage tolerance of certain parts or components indicates that these qualities cannot be achieved or can only be demonstrated using an inspection procedure whose practicability or reliability may be in doubt, then replacement or modification action may need to be defined.

4. INSPECTION PROGRAM. The purpose of a continuing airworthiness assessment in its most basic terms is to adjust the current maintenance inspection program, as required, to assure continued safety of the airplane type.

a. In accordance with paragraphs 1 and 2 of this appendix, an allowable limit of the size of damage should be determined for each site such that the structure has a residual strength for the load conditions specified in § 25.571, as defined in paragraph 2c. The size of damage that it is practical to detect by the proposed method of inspection should be determined, along with the number of flights required for the crack to grow from detectable to the allowable limit.

b. The recommended inspection program should be determined from the data described in paragraph a above, giving due consideration to the following:

(1) Fleet experience, including all of the scheduled maintenance checks;

(2) Confidence in the proposed inspection technique; and

(3) The joint probability of reaching the load levels described above and the final size of damage in those instances where probabilistic methods can be used with acceptable confidence.

c. Inspection thresholds for supplemental inspections should be established. These inspections would be supplemental to the normal inspections, including the detailed internal inspections.

(1) For structure with reported cracking, the threshold for inspection should be determined by analysis of the service data and available test data for each individual case.

(2) For structure with no reported cracking, it may be acceptable, provided sufficient fleet experience is available, to determine the inspection threshold on the basis of analysis of existing fleet data alone. This threshold should be set such as to include the inspection of a sufficient number of high-time airplanes to develop added confidence in the integrity of the structure (see paragraph 1c of this appendix). Thereafter, if no cracks are found, the inspection threshold may be increased progressively by successive inspection intervals until cracks are found. In the latter event, the criteria of paragraph (1) above would apply.

5. THE SUPPLEMENTAL STRUCTURAL INSPECTION DOCUMENT.

a. The Supplemental Structural Inspection Document should contain the recommendations for the inspection procedures and replacement or modification of parts or components necessary for the continued safe operation of the airplane. The document should be prefaced by the following information:

(1) Identification of the variants of the basic airplane type to which the document relates;

(2) A summary of the operational statistics of the fleet in terms of hours and flights, as well as a description of the typical mission, or missions;

(3) Reference to documents giving any existing inspections or modifications of parts or components;

(4) The types of operations for which the inspection program is considered valid; and

(5) A list of service bulletins (or other service information publication) revised as a result of the structural reassessment undertaken to develop the SID, including a statement that the operator must account for these service bulletins.

b. The document should contain at least the following information for each critical part or component:

(1) A description of the part or component and any relevant adjacent structure, including means of access to the part;

(2) The type of damage which is being considered (i.e., fatigue, corrosion, accidental damage);

(3) Relevant service experience;

(4) Likely site(s) of damage;

(5) Recommended inspection method and procedure and alternatives;

(6) Minimum-size of damage considered detectable by the method(s) of inspection;

(7) Service bulletins (or other service information publication) revised or issued as a result of in-service findings resulting from implementation of the SID (added as revision to the initial SID);

(8) Guidance to the operator on which inspection findings should be reported to the manufacturer;

(9) Recommended initial inspection threshold;

(10) Recommended repeat inspection interval;

(11) Reference to any optional modification or replacement of part or component as terminating action to inspection;

(12) Reference to the mandatory modification or replacement of the part or component at given life, if fail safety by inspection is impractical; and

(13) Information related to any variations found necessary to "safe lives" already declared.

c. The Supplemental Inspection Document should be checked from time to time against current service experience. Any unexpected defect occurring should be assessed as part of the continuing assessment of structural integrity to determine the need for revision of the document. Future structural service bulletins should state their effect on the SID.

APPENDIX 2

GUIDELINES FOR THE DEVELOPMENT OF A PROGRAM TO PREDICT AND ELIMINATE WIDESPREAD FATIGUE DAMAGE

1. GENERAL.

a. The likelihood of the occurrence of fatigue damage in an airplane's structure increases with the number of repeated load cycles the airplane experiences. During the design process the manufacturer selects a design service goal (DSG) in terms of flight cycles/hours for the airframe. The manufacturer designs the airplane to keep the probability of cracking to a minimum up to the design service goal. It is expected that any cracking that occurs during this period will occur in isolation, originating from a single source, such as a random manufacturing flaw (e.g., a misdrilled fastener hole). Because the manufacturing flaws are randomly distributed throughout the structure, it is considered unlikely that they will result in cracks that will interact strongly as they grow.

b. Uniformly loaded structure may develop cracks in adjacent fasteners, or in adjacent similar structural details, which interact to reduce the damage tolerance of the structure in a manner which may not be readily detectable. Widespread fatigue damage (WFD) is characterized by the simultaneous presence of cracks at multiple structural details that are of sufficient size and density whereby the structure will no longer meet its damage tolerance requirement, § 25.571 (e.g., not maintaining required residual strength after partial structural failure). Multiple Site Damage (MSD) is a source of WFD characterized by the simultaneous presence of fatigue cracks in the same structural element (e.g., fatigue cracks that may coalesce with or without other damage leading to the loss of the residual strength). Multiple Element Damage (MED) is a source of WFD characterized by the simultaneous presence of fatigue cracks in similar adjacent structural elements. The development of cracks at multiple locations (both MED and MSD) may result in strong interactions that can affect subsequent crack growth, in which case the predictions for local cracking would no longer apply. An example of this situation may occur at a fuselage skin lap joint. Simultaneous cracking at many fasteners along a common rivet line may reduce the residual strength of the joint below required levels before the cracks are readily detectable during routine maintenance

c. The methods used to date to develop structural inspection programs have generally considered only localized interactions between fatigue cracks. Since a few cracks of a size which may not be reliably detected by Non Destructive Testing (NDT) can cause unacceptable reduction in the structural strength below the residual strength requirements of the damage tolerance regulations, no widespread fatigue damage should be allowed within the original or extended design service goal of an airplane. Unless there is a high confidence in the ability to detect and rectify WFD in its early subcritical stages, continued safe operation of the airplane is jeopardized; therefore, it is necessary to take appropriate action in the aging fleets to preclude it. The manufacturers should conduct evaluations to determine where and when WFD may occur and provide instructions for the verification and removal of WFD in the airplane structure.

d. The occurrence of corrosion, or other structural degradation, can couple with fatigue cracking and reduce the effectiveness of an airplane's routine structural maintenance program.

2. STRUCTURAL EVALUATION FOR WFD.

a. General. The evaluation has three objectives:

(1) Identify primary structure susceptible to WFD (see paragraphs 2b(1) and 2b(2) of this appendix).

(2) Predict when it is likely to occur (see paragraph 2c of this appendix).

(3) Establish additional maintenance actions, as necessary, to ensure continued safe operation of the airplane (see paragraph 2d of this appendix).

b. Structure Susceptible to WFD. Susceptible structure is defined as that which has the potential to develop WFD. Such structure typically has the characteristics of similar details operating at similar stresses where structural capability could be affected by interaction of similar cracking. The generic types of susceptible structure include the following.

(1) Fuselage.

(a) Longitudinal skin joints, frames, and tear straps (MSD, MED),

(b) Circumferential joints and stringers (MSD, MED);

(c) Fuselage frames (MED);

(d) Aft pressure dome outer ring and dome web splices (MSD, MED);

(e) Other pressure bulkhead attachment to skin and web attachment to stiffener and pressure decks (MSD, MED);

(f) Stringer to frame attachments (MED);

(g) Window surround structure (MSD, MED);

(h) Over-wing fuselage attachments (MED);

(i) Latches and hinges of nonplug doors (MSD, MED);

(j) Skin at runout of large doubler (MSD);

(2) Wing and Empennage.

(a) Skin at runout of large doubler (MSD);

(b) Chordwise splices (MSD, MED);

(c) Rib to skin attachments (MSD, MED);

(d) Stringer runout (MED, MSD).

c. Determination of WFD. The time in terms of hours and/or flights to the occurrence of WFD should be established. The evaluation should include a complete review of the service history of the susceptible areas, relevant full-scale and component fatigue test data, teardown inspections, and any fractographic analysis available. The evaluation of test results for the reliable prediction of the time WFD occurs in each susceptible area should include appropriate test-to-structure factors and a scatter factor.

(1) Each susceptible area should be evaluated to establish the size and extent of multiple cracking that could cause the residual strength to degrade below certification levels.

(2) Each susceptible area should be evaluated for a discrete source damage event due to uncontained failure of engines, fan blades, and high-energy rotating machinery.

(3) Each susceptible area should be evaluated to establish the time WFD is expected to occur.

(a) This initial estimate may be analytically determined, supported by existing test or service evidence.

(b) Revised estimates of the time of WFD occurrence should be made based on additional information from the continuing assessment of the fleet-demonstrated capability and one or more of the following:

1 Additional fatigue and/or residual strength tests on a full-scale airplane structure or a full-scale component, followed by detailed inspections and analyses.

2 Testing of new or used structure on a smaller scale than full component tests (i.e., sub-component and/or panel tests).

3 Tear-down inspections (destructive) that could be done on structural components that have been removed from service.

4 Local teardown by selected, limited (non-destructive) disassembly and refurbishment of specific areas of high-time airplanes.

d. Maintenance Actions.

(1) For all areas that have been identified as susceptible to WFD, the current maintenance program should be evaluated to determine if adequate structural maintenance and inspection programs exist to safeguard the structure against unanticipated cracking or other structural degradation. The evaluation of these inspections should typically be done as follows:

(a) Determine the level (inspection threshold, repeat interval, and methods) of the inspection for each susceptible area that is necessary to maintain the required level of safety.

(b) Review the existing maintenance programs to determine if they provide the required level of safety.

(2) For airplanes approaching the estimated occurrence of WFD, a program should be developed and recommended to the FAA that provides for replacement or modification of the susceptible structural area.

e. Period of Evaluation Validity. The initial evaluation of the complete airframe should cover a significant forward projection of airplane usage beyond the design service goal. Typically an assessment through at least an additional twenty-five percent of the design service goal would provide a realistic forecast with reasonable planning time for necessary maintenance action. However, it may be appropriate to vary the evaluation validity period depending on issues such as:

(1) The projected useful life of the airplane at the time of the initial evaluation (could increase or decrease the validity period).

(2) Expectations of improved Non Destructive Inspection (NDI) technology (could decrease the initial validity period, pending new methods becoming available).

(3) Airline advance planning requirements for introduction of new maintenance and modification programs.

(4) Providing sufficient forward projection to identify all likely maintenance/modification actions essentially as one package.

Subsequent evaluations should follow similar validity period guidelines as the initial evaluation.

3. DOCUMENTATION.

a. The manufacturers should revise the SID as necessary and/or prepare Service Bulletins that contain the recommendations for inspection procedures and replacement or modification of parts or components necessary to preclude Widespread Fatigue Damage. Since WFD is applicable to all operators and is a safety concern for older airplanes, identified inspection or modification programs will be made mandatory. In addition, any service bulletins or other service information publications revised or issued as a result of in-service WFD findings resulting from implementation of these programs may require separate AD action.

b. If the manufacturer chooses not to update the SID or prepare Service Bulletins, it should develop a WFD document containing recommendations for inspection procedures and replacement or modification of parts or components necessary to preclude WFD. The document should be prefaced by the following:

(1) Identification of the variants of the basic airplane type to which the document relates;

(2) Summary of the operational statistics of the fleet in terms of hours and flights;

(3) Description of the typical mission, or missions;

(4) The types of operations for which the inspection program is considered valid;

(5) Reference to documents giving any existing inspections, or modification of parts or components; and

(6) Duration of evaluation validity.

c. The document should contain at least the following information for each critical part or component:

(1) Description of the primary structure susceptible to WFD

(2) The estimated threshold of MSD/MED and subsequent occurrence (hours/cycles) of WFD;

(3) Recommended initial inspection threshold;

(4) Recommended repeat inspection interval;

(5) Recommended inspection method and procedure and alternatives;

(6) Any optional modification or replacement of the structural element as terminating action to inspection;

(7) Any mandatory modification or replacement of the structural element;

(8) Service bulletins (or other service information publication) revised or issued as a result of in-service findings resulting from the WFD evaluations (added as a revision to the initial WFD document); and

(9) Guidance to the operator on which inspection findings should be reported to the manufacturer.

4. RESPONSIBILITY. It is expected that the evaluation will be conducted in a cooperative effort between the operators and manufacturers with participation by airworthiness authorities during the evaluation.

Recommendation Letter

Pratt & Whitney
400 Main Street
East Hartford, CT 06108

Pratt & Whitney
A United Technologies Company

October 22, 2003

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

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

Subject: ARAC Recommendations, Widespread Fatigue Damage Bridging Task

Reference: ARAC Tasking, Federal Register, dated December 15, 1999

Dear Nick,

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

- Widespread Fatigue Damage – Training Syllabus
- Widespread Fatigue Damage – Multiple Element Damage
- Widespread Fatigue Damage – Mandatory Modifications

The Working Group did achieve consensus and the reports were unanimously approved by TAEIG.

Sincerely yours,

Craig R. Bolt

C. R. Bolt
Assistant Chair, TAEIG

Copy: Dionne Krebs – FAA-NWR
Mike Kaszycki – FAA-NWR
Effie Upshaw – FAA-Washington, D.C.
Amos Hoggard - Boeing

Recommendation

A REPORT OF THE AIRWORTHINESS ASSURANCE WORKING GROUP

WIDESPREAD FATIGUE DAMAGE BRIDGING TASK
WFD Training Syllabus

FINAL REPORT

July 2003

SIGNED BY

Kyatsandra Gopinath
Co-Chairperson, AAWG
Boeing Commercial Airplanes

Aubrey Carter
Co-Chairperson, AAWG
Delta Air Lines

REVISION PAGE

LTR	DATE	CHANGE	PAGES ADDED	PAGES DELETED	PAGES CHANGED	APPROVED BY

Table of Contents

Abbreviations and Definitions

AATF	Airworthiness Assurance Task Force
AAWG	Airworthiness Assurance Working Group
AC	Advisory Circular (FAR)
ACJ	Advisory Circular (JAR)
AD	Airworthiness Directive
AECMA	Association des Entreprises de Construction Mécanique et Aeronautique
AIA	Aerospace Industries Association of America
ALI	Airworthiness Limitation Instructions
ALI	Airworthiness Limitation Instructions
ARAC	Aviation Rulemaking Advisory Committee
ART	Authorities Review Team
ATA	Air Transport Association of America
CAA-UK	Civil Aviation Authority - United Kingdom
CTOA	Crack Tip Opening Angle
DGAC	Direction Générale de l'Aviation Civile
DSG	Design Service Goal
EIFS	Equivalent Initial Flaw Size
ESG	Extended Service Goal
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FR	Failure Rate
GARTEUR	Group for Aeronautical Research and Technology in Europe
HMV	Heavy Maintenance Visit
IATA	International Air Transport Association
ICWFD	Industry Committee on Widespread Fatigue Damage
ISP	Inspection Start Point
JAA	Joint Aviation Authorities
JAR	Joint Aviation Requirement
LDC	Large Damage Capability
LOV	Limit of Validity
MED	Multiple Element Damage
MSD	Multiple Site Damage
NAARP	National Aging Aircraft Research Program
NDI	Non Destructive Inspection
NP	None Planned at this time
NPRM	Notice of Proposed Rulemaking
NTSB	National Transportation Safety Board
OEM	Original Equipment Manufacturer
PDF	Probability density Function
PMI	Principal Maintenance Inspector (FAA)
POD	Probability of Detection
RS	Residual Strength
RWG	Rule Writing Group
SAETG	Structural Audit Evaluation Task Group
SB	Service Bulletin
SDR	Service Difficulty Report (FAA)
SFAR	Special Federal Aviation Regulation
SIA	Structural Integrity Audit
SIF	Stress Intensity Factors
SMAAC	Structural Maintenance of Aging Aircraft
SMP	Structure Modification Point
SSIP	Supplemental Structural Inspection Program
STC	Supplemental Type Certificate
STG	Structures Task Group
TAEIG	Transport Airplane and Engines Issues Group
TARC	Technical Advisory Regulatory Committee
TC	Type Certification
TOGAA	Technical Oversight Group RE: Aging Aircraft
WFD	Widespread Fatigue Damage

REFERENCES

[1] NTSB Report No. NTSB/AAR - 89/03, RE: 1988 Aloha Airlines 737 Accident.

[2] A Report of the AATF on Fatigue Testing and/or Teardown Issues, February 1991, Available from the ATA.

[3] Ronald Wickens *et.al,* 'Structural Fatigue Evaluation for Aging Airplanes', final report of the Airworthiness Assurance Working Group, October 1993

[4] McGuire et al, 'Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Airplane Fleet', Revision A, June 29, 1999.

1.0 EXECUTIVE SUMMARY

In 1997, the FAA tasked ARAC, TAEIG and the Airworthiness Assurance Working Group to examine whether or not regulatory action was required to prevent widespread fatigue damage in the commercial airplane fleet. In 2001, ARAC proposed new rules and advisory information as a result of the 1997 tasking. The new rules and advisory information represent a significant shift in the way airplane maintenance programs will be established in the future to prevent widespread fatigue damage. Following submittal it was determined that there would need to be a substantial training task for all areas of the industry to insure uniform implementation of the rules. The AAWG was tasked to provide a training syllabus on the rule and advisory information. This report contains that syllabus.

The AAWG recommends that the training material attached as Appendix E and F be used to provide training for those individuals who are will be responsible for developing, approving and/or implementing maintenance programs for WFD.

2.0 - AVIATION RULEMAKING ADVISORY COMMITTEE TASKING

On August 28, 1997, the FAA formally notified the Aviation Rulemaking Advisory Committee; Transport Airplane and Engines Group through the Federal Register (Page 62 FR 45690 No. 167 08/28/97) of a new task assignment for action. The complete text of the Tasking Statement appears in Appendix A. Subsequently, the Transport Airplane and Engines Issues Group assigned action to the Airworthiness Assurance Working Group. The Task Assignment involves completion of the following tasks.

Task Title: Task 5: FAR/JAR 25, DEVELOP TECHNICAL POSITION RE: WIDESPREAD FATIGUE DAMAGE

Task Title: Task 6: FAR/JAR 25, TASK 6: AGING AIRCRAFT PROGRAM (WIDESPREAD FATIGUE DAMAGE) (WFD)

Task Title: Task 6A: FAR/JAR 25, WFD BRIDGING TASKS

Task Description Task 5:

(1) ARAC is tasked to review the capability of analytical methods and their validation; related research work; relevant full-scale and component fatigue test data; and tear down inspection reports, including fractographic analysis, relative to the detection of widespread fatigue damage (WFD). Since airplanes in the fleet provide important data for determining where and when WFD is occurring in the structure, ARAC will review fractographic data from representative “fleet leader” airplanes. Where sufficient relevant data for certain airplane models does not exist, ARAC will recommend how to obtain sufficient data from representative airplanes to determine the extent of WFD in the fleet. The review should take into account the Airworthiness Assurance Harmonization Working Group report “Structural Fatigue Evaluation for Aging Aircraft” dated October 14, 1993, and extend its applicability to all transport category airplanes having a maximum gross weight greater than 75,000 pounds.

(2) ARAC will produce time standards for the initiation and completion of model specific programs (relative to the airplane’s design service goal) to predict, verify and rectify widespread fatigue damage. ARAC will also recommend action that the Authorities should take if a program, for certain model airplanes, is not initiated and completed prior to those time standards. Actions that ARAC will consider include regulations to require Type Certificate holders to develop WFD programs, modification action, operational limits, and inspection requirements to assure structural integrity of the airplanes. ARAC will provide a discussion of the relative merits of each option.

This task should be completed within 18 months of tasking.

As a result of the completion of the tasking, the FAA expects a task report detailing the investigations conducted along with recommendations for further FAA Action. While the recommendations may include a requirement to develop regulatory action, the actual writing of that requirement will be reserved to the FAA or assigned as an additional ARAC Tasking.

This report comprises the recommendations from the AAWG on the task assignment from ARAC. The Working Group Activity Reports presented to ARAC by the AAWG documenting the progress in completing the task are contained in Appendix B.

August 28, 1997, the FAA formally notified the Aviation Rulemaking Advisory Committee; Transport Airplane and Engines Group through the Federal Register (**45690 Federal Register / Vol. 62, No. 167 /**) (See Appendix A for complete tasking statement) of a new task assignment for action. The FAA requested the Aviation Rulemaking Advisory Committee to review and validate analytical methods relative to the industries ability to determine and correct Widespread Fatigue Damage. It also requested that ARAC evaluate if new rules and advisory information were needed to control prevent the development of WFD in the commercial fleet of airplanes. Work on this task was assigned to the Airworthiness Assurance Working Group (AAWG) and that work was completed and submitted to the FAA in July 1999.

Task Description Task 6:

The recommendations of the 1997 tasking were that new rules and advisory material were necessary for the preclusion of WFD in the commercial fleet. As a result, a second tasking was issued on December 15, 1999 **(70104 Federal Register / Vol. 64, No. 240 /)** (See Appendix A for complete tasking statement**)**, for the AAWG to write the required rules and advisory material. This Tasking was complete and the rules submitted for processing in December 2000.

Task Description Task 6A:

In the process of completing these taskings, several technical issues were not thoroughly addressed because the AAWG did not have time to appropriately address them. These issues were identified and submitted with the Draft NPRM and Advisory material and became known as Bridging Tasks. These Bridging tasks are the subject of this report. The submission of this report satisfies all open technical issues with Task 6.

There are four Bridging Tasks

1. MED Technical Considerations

2. Training

3. NDI Round Robin

4. Mandatory Modifications

This Report addresses the second Bridging Task, Training.

3.0 – BRIDGING TASK B - TRAINING

The AAWG made a decision that the training should be divided into two separate packages. The first package defining the rule concepts. The second package describing the technical consideration in developing a maintenance program that would effectively prevent WFD in the commercial fleet. These are attached as Appendix E and F of this report.

4.0 – RECOMMENDATIONS

The AAWG recommends that the training material attached as Appendix E and F be used to provide training for those individuals who are will be responsible for developing, approving and/or implementing maintenance programs for WFD.

APPENDIX A – FAA/ARAC TASK 5 and 6 –AAWG

TASK 5 – DEVELOP TECHNICAL POSITION RE: WIDESPREAD FATIGUE DAMAGE

PAGE: 62 FR 45690 NO. 167 08/28/97

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Aviation Rulemaking Advisory Committee; Transport Airplane and Engine

Issues—New Task

AGENCY: Federal Aviation Administration (FAA), DOT.

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

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

FOR FURTHER INFORMATION CONTACT: Stewart R. Miller, Manager, Transport Standards Staff, ANM-110, FAA, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Ave. SW., Renton, WA 98055-4056, telephone (425) 227-2190, fax (425) 227-1320.

SUPPLEMENTARY INFORMATION:

Background

The FAA has established an Aviation Rulemaking Advisory Committee to provide advice and recommendations to the FA 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 of the FAA's commitment to harmonize its Federal Aviation Regulations (FAR) and practices with the aviation authorities in Europe and Canada.

One area ARAC deals with is Transport Airplane and Engine Issues. These issues involve the airworthiness standard for transport category airplanes in 14 CFR part 25, 33, and 35 and parallel provisions in 14 CFR parts 121 and 135. The corresponding European airworthiness standards for transport category airplanes are contained in Joint Aviation Requirements (JAR)-25, JAR-E and JAR-P, respectively. The corresponding Canadian Standards are contained in Chapters 525, 533 and 535 respectively.

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:

FAR/JAR 25 Aging Aircraft

1. ARAC is tasked to review the capability of analytical methods and their validation; related research work; relevant full-scale and component fatigue test data; and tear down inspection reports, including fractographic analysis, relative to the detection of widespread fatigue damage (WFD). Since aircraft in the fleet provide important data for determining where and when WFD is occurring in the structure, ARAC will review fractographic data from representative "fleet leader" airplanes. Where sufficient relevant data for certain airplane models does not currently exist, ARAC will recommend how to obtain sufficient data from representative airplanes to determine the extent of WFD in the fleet. The review should take into account the Airworthiness Assurance Harmonization Working Group report "Structural Fatigue Evaluation for Aging Aircraft" dated October 14, 1993, and extend its applicability to all transport category airplanes having a maximum gross weight greater than 75,000 pounds.
2. ARAC will produce time standards for the initiation and completion of model specific programs (relative to the airplane's design service goal) to predict, verify and rectify widespread fatigue damage. ARAC will also recommend action that the Authorities should take if a program, for certain model airplanes, is not initiated and completed prior to those time standards. Actions that ARAC will consider include regulations to require Type Certificate holders to develop WFD programs, modification actions, operational limits, and inspection requirements to assure structural integrity of the airplanes. ARAC will provide a discussion of the relative merits of each option.
3. This task should be completed within 18 months of tasking.

ARAC Acceptance of Task

ARAC has accepted this task and will assign it to a working group. The working group will serve as staff to ARAC to assist ARAC in the analysis of the assigned task. Working group recommendations must be reviewed and approved by ARAC. If ARAC accepts the working group's recommendations, it forwards them to the FAA and ARAC recommendations.

Working Group Activity

The working group is expected to comply with the procedure adopted by ARAC. As part of the procedures, the working group is expected to:

1. Recommend a plan for completion of the task, including rationale, for FAA/JAA approval within six months of publication of this notice.
2. Give a detailed conceptual presentation of the proposed recommendations, prior to proceeding with its work.
3. Provide a status report at each meeting of ARAC held to consider Transport Airplane and Engine Issues.

Participation in the Working Group

The working group will be composed of experts having an interest in the assigned task. A working group member need not be a representative of a member of the full committee.

An individual who has expertise in the subject matter and wishes to become a member of the working group should write to the person listed under the caption FOR FURTHER INFORMATION CONTACT expressing that desire, describing his or her interest in the task, and

stating the expertise he or she would bring to the working group. The request will be reviewed by the assistant chair, the assistant executive director, and the working group chair and the individual will be advised whether or not the request can be accommodated.

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

Meetings of ARAC will be open to the public, except as authorized by section 10(d) of the Federal Advisory Committee Act. Meetings of the working group will not be open to the public, except to the extent that individuals with an interest and expertise are selection to participate. No public announcement of working group meetings will be made.

Issued in Washington, DC, on August 21, 1997.

Joseph A. Hawkins,

Executive Director, Aviation Rulemaking Advisory Committee.

[FR Doc. 97-22922 Filed 8-27-97; 8:45 am]

BILLING CODE 4910-13-M

TASK 6: AGING AIRCRAFT PROGRAM (WIDESPREAD FATIGUE DAMAGE) (WFD)

[Federal Register: December 15, 1999 (Volume 64, Number 240)]
[Notices]
[Page 70104-70105]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]
[DOCID:fr15de99-112]

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

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

AGENCY: Federal Aviation Administration (FAA), DOT.

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

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

FOR FURTHER INFORMATION CONTACT: Kristin Larson, Transport Standards Staff, ANM-110, FAA, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Ave. SW., Renton, WA 98055-4056, telephone (425) 227-1760, fax (425) 227-1100.

SUPPLEMENTARY INFORMATION:

Background

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

One area ARAC deals with is transport airplane and engine issues. These issues involve the airworthiness standards for transport category airplanes in 14 CFR parts 25, 33, and 35 and parallel provisions in 14 CFR parts 121 and 135. The corresponding European airworthiness standards for transport category airplanes are contained in Joint Aviation Requirements (JAR)-25, JAR-E and JAR-P, respectively. The corresponding Canadian Standards are contained in Chapters 525, 533, and 535, respectively.

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 6: Aging Aircraft Program (Widespread Fatigue Damage) (WFD)

The FAA requests that ARAC propose new operating rules (14 CFR parts 91, 121, 125, 129, and 135) that would ensure that no large transport category airplane (>75,000 lbs. Gross Take Off Weight) is operated beyond the flight cycle limits to be specified in the regulation, unless an ``Aging Aircraft Program'' has been incorporated into the operator's maintenance program.

[[Page 70105]]

The proposed rule and advisory material will establish:
1. The content of the Aging Aircraft Program (e.g., the necessary special inspections and modification actions for prevention of WFD), and
2. A limit of the ``validity'' (in terms of flight cycles or hours) of the Aging Aircraft Program where additional reviews are necessary for continued operation.
Additionally, ARAC is asked to review 14 CFR 25.1529 and 14 CFR part 25, Appendix H, and recommend changes to establish:
1. The required content of an Aging Aircraft Program.
2. The criteria by which to determine the validity of the Aging Aircraft Program (in terms of flight cycles or flight hours). This would effectively prohibit the operation of airplanes beyond the limited validity of the maintenance program. In order to operate beyond the declared limit, further evaluation of the design must be accomplished and the additional inspections and/or modifications added to the Aging Aircraft Program as necessary.
The FAA may ask ARAC to recommend disposition of any substantive comments the FAA receives in response to any of the notices of proposed rulemaking that result from ARAC's recommendations.
The FAA expects ARAC to forward its recommendations to the FAA within 9 months after tasking.

ARAC Acceptance of Task

ARAC has accepted this task and has chosen to assign it to the existing Airworthiness Assurance Working Group. The working group serves as staff to ARAC to assist ARAC in the analysis of the assigned task. Working group recommendations must be reviewed and approved by ARAC. If ARAC accepts the working groups recommendations, it forwards them to the FAA as ARAC recommendations.

Working Group Activity

The 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 ARAC to consider transport airplane and engine issue held following publication of this notice.
2. Give a detailed conceptual presentation of the proposed recommendations, prior to proceeding with its work.
3. Draft appropriate regulatory documents with supporting economic and other required analyses, and any other related guidance material or collateral documents to support its recommendations.
4. Provide a status report at each meeting of ARAC held to consider transport airplane and engine issues.

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

Meetings of ARAC will be open to the public, except as authorized by section 10(d) of the Federal Advisory Committee Act. Meetings of the Airworthiness Assurance Working Group will not be open to the public, except to the extent that individuals with an interest and expertise are selected to participate. No public announcement of working group meetings will be made.

Issued in Washington, DC, on December 9, 1999.
Anthony F. Fazio,
Executive Director, Aviation Rulemaking Advisory Committee.
[FR Doc. 99-32462 Filed 12-14-99; 8:45 am]
BILLING CODE 4910-13-M

APPENDIX B - AAWG Task Group Make-up

NAME	*Organization*	*E-Mail*
Bandley. B.	FAA-LAACO	BrentBandley@faa.gov
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Schmidt, B.	Airbus Deutschland	Bianka.Schmidt-Brandecker@airbus.com

APPENDIX C - Meeting Venues

Meeting Schedule
AAWG - RWG Meetings

RWG Meeting No.	*Location*	*Dates Week of*
11	Gatwick UK	Aug 20, 2001
12	Long Beach CA	Jan 28, 2001
13	Gatwick UK	Apr 22, 2002
14	Savannah GA	Jun 24, 2002
15	Dresden GER	Sep 23, 2002
16	Seattle WA	Jan 20, 2002
17	Gatwick UK	April 2003

APPENDIX D – Meeting Attendance

MEETING ATTENDANCE
Regular Members

Name	*Representing*	Meeting Number															
		1	2	3	4	5	6	7	8	9	11	12	13	14	15	16	17
A. Santgerma	Airbus	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
R. Boetsch	Airbus	X	X	X	X	X	X	X	X	X	X	X	X		X		
R. Collins	Airbus	X	X	X	X	X	X	X	X	X			X				X
A. Hoggard	BCA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
B. Bandley	FAA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
B. Eastin	FAA										X	X		X	X	X	X
D. Marsh	BCA	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
J. Bristow	CAA-UK	X		X	X	X	X	X	X	X	X		X	X	X	X	X
A. Carter	Delta A/L	X	X	X	X	X	X		X	X	X	X	X	X		X	X
B. Schmidt	Airbus	X	X	X		X		X	X	X	X						
J. Peltz	FedEx				X	X	X	X	X	X	X	X	X	X		X	
D. Horne	FedEx				X	X	X	X	X	X	X	X	X	X		X	
M. Yerger	FedEx	X	X	X	X												
James Burd	Gulfstream					X	X	X	X	X	X	X	X	X	X	X	
Bert Hoogeland	KLM	X	X			X	X	X	X	X							
Ed Ingram	Lockheed-Martin	X	X		X	X	X										
Frank Perrin	DGAC-FR											X	X	X	X		
Donn Knight	UPS		X														

Also in Attendance at Meeting 14

Also in Attendance at Meeting 14 – Jeff Kollgaard, Boeing
Richard Minter represented John Bristow at the meeting.

APPENDIX E – Training Syllabus – The New Rules

APPENDIX F – Training Syllabus – The Technical Requirements

A REPORT OF THE AIRWORTHINESS ASSURANCE WORKING GROUP

WIDESPREAD FATIGUE DAMAGE BRIDGING TASK
Multiple Element Damage

<u>FINAL REPORT</u>

July 2003

SIGNED BY

Rao Varanasi
fr

Kyatsandra Gopinath
Co-Chairperson, AAWG
Boeing Commercial Airplanes

Aubrey Carter

Aubrey Carter
Co-Chairperson, AAWG
Delta Air Lines

REVISION PAGE

LTR	DATE	CHANGE	PAGES ADDED	PAGES DELETED	PAGES CHANGED	APPROVED BY

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List of Figures

Abbreviations and Definitions

AATF	Airworthiness Assurance Task Force
AAWG	Airworthiness Assurance Working Group
AC	Advisory Circular (FAR)
ACJ	Advisory Circular (JAR)
AD	Airworthiness Directive
AECMA	Association des Entreprises de Construction Mécanique et Aeronautique
AIA	Aerospace Industries Association of America
ALI	Airworthiness Limitation Instructions
ALI	Airworthiness Limitation Instructions
ARAC	Aviation Rulemaking Advisory Committee
ART	Authorities Review Team
ATA	Air Transport Association of America
CAA-UK	Civil Aviation Authority - United Kingdom
CTOA	Crack Tip Opening Angle
DGAC	Direction Générale de l'Aviation Civile
DSG	Design Service Goal
EIFS	Equivalent Initial Flaw Size
ESG	Extended Service Goal
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FR	Failure Rate
GARTEUR	Group for Aeronautical Research and Technology in Europe
HMV	Heavy Maintenance Visit
IATA	International Air Transport Association
ICWFD	Industry Committee on Widespread Fatigue Damage
ISP	Inspection Start Point
JAA	Joint Aviation Authorities
JAR	Joint Aviation Requirement
LDC	Large Damage Capability
LOV	Limit of Validity
MED	Multiple Element Damage
MSD	Multiple Site Damage
NAARP	National Aging Aircraft Research Program
NDI	Non Destructive Inspection
NP	None Planned at this time
NPRM	Notice of Proposed Rulemaking
NTSB	National Transportation Safety Board
OEM	Original Equipment Manufacturer
PDF	Probability density Function
PMI	Principal Maintenance Inspector (FAA)
POD	Probability of Detection
RS	Residual Strength
RWG	Rule Writing Group
SAETG	Structural Audit Evaluation Task Group
SB	Service Bulletin
SDR	Service Difficulty Report (FAA)
SFAR	Special Federal Aviation Regulation
SIA	Structural Integrity Audit
SIF	Stress Intensity Factors
SMAAC	Structural Maintenance of Aging Aircraft
SMP	Structure Modification Point
SSIP	Supplemental Structural Inspection Program
STC	Supplemental Type Certificate
STG	Structures Task Group
TAEIG	Transport Airplane and Engines Issues Group
TARC	Technical Advisory Regulatory Committee
TC	Type Certification
TOGAA	Technical Oversight Group RE: Aging Aircraft
WFD	Widespread Fatigue Damage

REFERENCES

[1] NTSB Report No. NTSB/AAR - 89/03, RE: 1988 Aloha Airlines 737 Accident.

[2] A Report of the AATF on Fatigue Testing and/or Teardown Issues, February 1991, Available from the ATA.

[3] Ronald Wickens *et.al,* 'Structural Fatigue Evaluation for Aging Airplanes', final report of the Airworthiness Assurance Working Group, October 1993

[4] McGuire et al, 'Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Airplane Fleet', Revision A, June 29, 1999.

[5] Galella, 'Inspection Capability and Reliability Detection Assessments for Widespread Fatigue Damage,' FAA William J. Hughes Technical Center, Atlantic City New Jersy, To Be Published.

1.0 EXECUTIVE SUMMARY

In 1997, the FAA tasked ARAC, TAEIG and the Airworthiness Assurance Working Group to examine whether or not regulatory action was required to prevent widespread fatigue damage in the commercial airplane fleet. In 2001, ARAC proposed new rules and advisory information as a result of the 1997 tasking. During the study, ARAC examined methodologies used by the industry to characterize Multiple Site Damage, a source of widespread fatigue damage. ARAC did not have sufficient time to examine or characterize Multiple Element Damage, the other form of damage that can lead to WFD. The purpose of this report is to complete the technical work to characterize MED. In the process of examining MED, the AAWG arrived at ten conclusions and six recommendations.

CONCLUSIONS:

The AAWG reached the following conclusions as a result of this tasking.

1. The areas designated as susceptible to MED, and documented in Reference [4], are still valid and are inclusive of the situations found in-service and test.
2. The identification of the failure scenario for SMP is a critical element in defining the MED problem and may involve other failure modes than static or fatigue overload.
3. The subject of the development of adjacent cracks for MED situations was studied and while it was determined that there was only a small probability of this happening at an SMP, adjacency should be enforced for conservatism.
4. Typically, there is no crack interaction in MED situations, however load redistribution should be considered when load path failure occurs.
5. The MED round robins examined several methods with probabilistic elements that appear to give valid and conservative approaches to the establishment of maintenance programs for MED and were effective in defining important parameters in the analysis. The MED round robin demonstrated that the industry was capable of performing the necessary assessments
6. The methodology and procedures outlined in Reference [4] on MSD are generally applicable to evaluating MED situations. Industry is well prepared to perform the analysis.
7. The application of risk assessment methodology for the development of maintenance programs for WFD would require significant changes in the regulations and significant validation that is currently beyond industry capability.
8. The implementation of maintenance programs for WFD is not dependant on the development of new NDI procedures, however more efficient means of inspecting large areas would be desirable.
9. The concept of ISP, SMP, LOV and normal maintenance is still valid for management of MED situations. Other than those concepts already

considered for MSD, there are no additional maintenance requirements for the management of MED.

10. Although there has been a high level of safety achieved through implementation of the existing aging airplane programs, rulemaking is still needed to implement programs for the prevention of WFD.

RECOMMENDATIONS:

The AAWG reached six recommendations:

1. With regards to the risk analysis approach, additional studies are recommended to demonstrate the capability of the approach. These studies will lead to a foundation upon which new rules could be crafted for compliance.
2. The AAWG reviewed the capability of the industry to perform probabilistic based analysis of the MED situation and has found that sufficient maturity of the procedures exist to recommend that analysis can be used for development of effective maintenance programs.
3. In performing the MED analysis, the AAWG recommends that the condition of adjacency be enforced unless there is a compelling reason not to do so.
4. The AAWG recommends that no airplane should be allowed to fly past the detail specific SMP without modification. This is a necessity, since allowing airplanes to fly past the established SMP would create a safety situation that would be very difficult to manage and maintain airworthiness.
5. The AAWG recommends that the operational rules for WFD proposed for 14 CFR Part 121, 135 et al and the certification rules proposed for 14 CFR Parts 25 be given the highest priority within the FAA for promulgation.
6. The AAWG recommends that the industry support the FAA to see that there is a timely publication of the necessary rules for WFD.

2.0 AVIATION RULEMAKING ADVISORY COMMITTEE TASKING

On August 28, 1997, the FAA formally notified the Aviation Rulemaking Advisory Committee; Transport Airplane and Engines Group through the Federal Register (Page 62 FR 45690 No. 167 08/28/97) of a new task assignment for action. The complete text of the Tasking Statement appears in Appendix A. Subsequently, the Transport Airplane and Engines Issues Group assigned action to the Airworthiness Assurance Working Group. The Task Assignment involves completion of the following tasks.

Task Title: Task 5: FAR/JAR 25, DEVELOP TECHNICAL POSITION RE: WIDESPREAD FATIGUE DAMAGE

Task Title: Task 6: FAR/JAR 25, TASK 6: AGING AIRCRAFT PROGRAM (WIDESPREAD FATIGUE DAMAGE) (WFD)

Task Title: Task 6A: FAR/JAR 25, WFD BRIDGING TASKS

Task Description Task 5:

(1) ARAC is tasked to review the capability of analytical methods and their validation; related research work; relevant full-scale and component fatigue test data; and tear down inspection reports, including fractographic analysis, relative to the detection of widespread fatigue damage (WFD). Since airplanes in the fleet provide important data for determining where and when WFD is occurring in the structure, ARAC will review fractographic data from representative “fleet leader” airplanes. Where sufficient relevant data for certain airplane models does not exist, ARAC will recommend how to obtain sufficient data from representative airplanes to determine the extent of WFD in the fleet. The review should take into account the Airworthiness Assurance Harmonization Working Group report “Structural Fatigue Evaluation for Aging Aircraft” dated October 14, 1993, and extend its applicability to all transport category airplanes having a maximum gross weight greater than 75,000 pounds.

(2) ARAC will produce time standards for the initiation and completion of model specific programs (relative to the airplane’s design service goal) to predict, verify and rectify widespread fatigue damage. ARAC will also recommend action that the Authorities should take if a program, for certain model airplanes, is not initiated and completed prior to those time standards. Actions that ARAC will consider include regulations to require Type Certificate holders to develop WFD programs, modification action, operational limits, and inspection requirements to assure structural integrity of the airplanes. ARAC will provide a discussion of the relative merits of each option.

This task should be completed within 18 months of tasking.

As a result of the completion of the tasking, the FAA expects a task report detailing the investigations conducted along with recommendations for further FAA Action. While the recommendations may include a requirement to develop regulatory action, the actual writing of that requirement will be reserved to the FAA or assigned as an additional ARAC Tasking.

The Report Ref [4], comprises the recommendations from the AAWG on the Task 5 assignment from ARAC. The recommendations of that report conclude that new or revised Part 25 rules are required to control WFD in the commercial fleet of airplanes.

Task Description Task 6:

On December 15, 1999, **(70104 Federal Register / Vol. 64, No. 240 /)** (See Appendix A for complete tasking statement**)**, the FAA requested that ARAC propose new operating rules (14 CFR parts 91, 121, 125, 129, and 135) that would ensure that no large transport category airplane (>75,000 lbs. Gross Take Off Weight) is operated beyond the flight cycle limits to be specified in the regulation, unless an ``Aging Aircraft Program'' has been incorporated into the operator's maintenance program. This Tasking was complete and the rules submitted for processing in December 2000.

Task Description Task 6A:

In the process of completing these taskings, several technical issues were not thoroughly addressed because the AAWG did not have time to appropriately address them. These issues were identified and submitted with the Draft NPRM and Advisory material and became known as Bridging Tasks. These Bridging tasks are the subject of this report. The submission of this report satisfies all open technical issues with Task 6.

There are four Bridging Tasks

1. MED Technical Considerations

2. Training

3. NDI Round Robin

4. Mandatory Modifications

This Report addresses the first and third Bridging Tasks; MED Technical Considerations, and the NDI Round Robin.

3.0 AIRWORTHINESS ASSURANCE WORKING GROUP

The AAWG is a duly constituted Federal Advisory Committee Act (FACA) entity. The AAWG reports to the Aviation Rulemaking Advisory Committee, Transport Airplane and Engine Issues Group (ARAC TAEIG). The AAWG was formed shortly after the 1988 Accident in Hawaii involving an older Boeing 737 in which a large section of fuselage departed the airplane. The AAWG has been active ever since examining the health of the fleet and proposing additional programs to maintain overall integrity of the commercial fleet. The membership of the AAWG consists of representation from:

Airbus*
Airline Pilot's Association
American Airlines
American West Airlines
Boeing Commercial Airplanes*
Airbus-UK
British Airways
Continental Airlines*
Delta Air Lines Incorporated*
DHL Airways Incorporated
Evergreen International Airlines
Federal Aviation Administration*
Federal Express*
Fokker Service
International Air Transport
Joint Airworthiness Authorities*
Lockheed Martin
Northwest Airlines
Regional Airline Association
United Airlines
United Parcel Service
US Airways

The AAWG established a task group to prepare and finalize the recommendations from this Tasking. The entities identified by an asterisk, together with Gulfstream participated in the task group. In completing the Task, the AAWG met six times in an 18-month period. A list of meeting venues and meeting attendance is documented in Appendices C and D respectively.

4.0 BACKGROUND

In 1988, the industry experienced a significant failure of the airworthiness system. This system failure allowed an airplane to fly with significant unrepaired multiple site fatigue damage to the point where the airplane experienced a rapid fracture and loss of a portion of the fuselage. As a direct result of this accident, the FAA hosted "The International Conference on Aging Airplanes" on June 1-3, 1988 in Washington D. C. As a result of this conference, an organization of Operators, Manufacturers and Regulators was formed under the Federal Advisory Committee Act to investigate and propose solutions to the problems evidenced as a result of the accident. This group is now known as the Airworthiness Assurance Working Group (AAWG) (Formally know as the Airworthiness Assurance Task Force).

During the 1988 conference, several Airline/Manufacturer recommendations were presented to address the apparent short falls in the airworthiness system including Recommendation 3, which stated:

> "Continue to pursue the concept of teardown of the oldest airline aircraft to determine structural condition, and conduct fatigue tests of older airplanes per attached proposal."

In June 1989, the National Transportation Safety Board (NTSB) made Recommendation 89067 (Reference[1]) that requested the FAA to pursue necessary tasks to ensure continued safe operations with probable widespread fatigue damage (WFD). WFD was noted by the NTSB to be a contributing cause of the April 1988 Aloha Airlines 737 accident. The NTSB specifically recommended extended fatigue testing for older airplanes. In November 1989, the FAA responded by issuing a straw man SFAR RE: TWO-LIFE TIME FATIGUE TEST FOR OLDER AIRPLANES.

In June 1990, the AAWG tasked the formal evaluation of the AIA/ATA Recommendation 3. An alternative approach, Reference [2,3], to the straw man SFAR was developed by the AAWG and presented to the FAA in March 1991. The FAA accepted this alternative approach in June 1991. The AAWG was informally tasked to institutionalize the position in July.

The AAWG task objective was:

> The AAWG shall make recommendations on whether new or revised requirements for structural fatigue evaluation can and should be instituted as an airplane ages past its design service goal. These recommendations are limited to the A300 (Models B2, B4-100, B4-200, C4 and F4), BAC1-11, 707/720, 727, 737 (Models 100 and 200), 747 (Models 100 and 200), DC-8, DC-9, DC-10, F-28 and L-1011 airplanes.

In December 1992, the task was formally published in the Federal Register as an Aviation Rulemaking Advisory Committee (ARAC) task directed to the AAWG from the Transport Aircraft and Engine Issues Group (TAEIG). The task assigned was:

> Task 3 - Structural Fatigue Audit: Develop recommendations on whether new or revised requirements for structural fatigue evaluation and corrective action should be instituted and made mandatory as the airplane ages past its original design life goal.

In accomplishing the task, the AAWG assembled a subset of the working group to reach industry consensus. Industry participation in the task group included members from ATA, IATA, AIA, AECMA, FAA and JAA. In October of 1993, the AAWG formally presented their recommendations, Reference [3] to ARAC concerning Task 3. In general, those recommendations included a proposal for revising existing guidance material and that voluntary audits be conducted for the eleven "AAWG" models.

This tasking was followed by two additional taskings in 1997 and in 1999 in which the AAWG was asked to revisit the subject of WFD and evaluate whether or not voluntary audits were working, The AAWG concluded in 1999 that additional rules and advisory material were needed to insure that audits would be done and subsequently were tasked to propose rules and advisory information.

5.0 BRIDGING TASK A – MULTIPLE ELEMENT DAMAGE

A. Description of Task

The purpose of this task is to identify and quantify the variables in the assessment of airplane structure susceptible to developing Multiple Element Fatigue Damage, a precursor of widespread fatigue damage.

B. AAWG Process

The AAWG, in assigning the project to the Rule Writing Group, highlighted six issues that the RWG should consider. These issues were:

- Identification of critical design details susceptible to MED
- Description of initial flaw characterization process (locations, directions, sizes and time distribution)
- Discussion of the acceptability of risk analysis and probabilistic approaches
- Discussion of the probability of MSD/MED interaction
- Identification of MED failure criteria (static instability, large damage capability, crack arrest)
- Discussion of new maintenance requirements necessary for the prevention of WFD caused by MED

The six issues were broadly split into two categories, in-service or in-test MED experience and analytical approaches and accommodations. To begin, the RWG looked at a cross section of in-service/test MED events in order to establish if any special conditions might be present when considering MED. Second, the AAWG took an extended look at the methodologies used for MED characterization. Specifically, the applicability of methodologies developed for MSD for use in MED situations was examined. To develop an understanding of the methodologies, three MED round-robins were performed.

1) In-service/test MED Experience

Each participant was encouraged to present examples of Multiple Element Damage that have occurred either in-service or in test. They were further requested to present any collateral information such as mitigating service action. The specific assignment was:

OEMs and Operators review test and in-service failures for MED situations of baseline structure. Look for unique examples that exemplify the followings residual strength conditions:

- Conditions where failure would occur due to static stability

    - Tension
    - Compression
- Condition where failure could occur due to residual strength (e.g. LDC or crack arrest)
- Conditions involving stack ups or bonded line failures.

As a result of this review, the AAWG did not discover any new MED scenarios in their examination of OEM and Airline MED specific cases. The areas designated as MED in Section 5.2 of Ref [4] are still valid and, at the present, are all inclusive of the situations encountered in service and test.

Table 5.1 summarizes the findings of the review

From the examples presented, the following conclusions were drawn:

- Some MED situations could have been found through normal routine maintenance inspections. However, reliance on routine maintenance generally results in a situation that involves a large number of airplanes with attendant immediate inspection/repair issues.
- Crack Interaction in MED situations appears to be limited to when an element in a multiple element load path is severed.
- The numbers of critical locations are finite compared to MSD situations.
- Inspections tend to be well defined and easily accomplished. There is potentially less dependence on NDI for finding MED.
- It appears that MED tends to happen early in the life of the airplane due to fatigue hot spots in the structure. Manufacturers need to carefully considered hot spots in their structure for potential MED situations.
- Interaction of cracks should be considered after a load path is broken.
- The reduction of in-service data for use in probabilistic models should be carefully considered. Identification of populations of un-cracked, cracked and failed components might require specific reduction techniques to arrive at appropriate maintenance actions. This is especially true of situations where MSD and MED are already prevalent in a detail in a fleet of airplanes.

Figure 5.1 shows a comparison of the interaction differences that exist between MSD and MED.

STRUCTURAL ELEMENT	FATIGUE SENSITIVE DETAIL	SOURCE OF DAMAGE	TEST/SERVICE	ACCESS FOR INSPECTION	NUMBER OF SENSITIVE DETAILS	INTERACTION WITH SIMILAR ELEMENTS BEFORE FAILURE ?	CRACKS APPEARED IN ADJACENT STRUCTURE ?	CATASTROPHIC FAILURE OCCURRED ?
FRAMES (Fig. 5.1, 5.4, 5.6 of Ref [4])	Fastener holes in web at run-out joint	High bending stress	Test and Service	Internal. Visible part. NDT inspection.	<10 both sides	No	No	No
	Stringer mouse hole	High local tension stress	Test and Service	Internal. Visible part. Visual inspection possible.	??	No	No	No
	Open holes in flange, or web	High local tension stress	Test and Service	Internal. Visible part. Visual inspection possible.	??	No	No	No
	Fastener holes at Passenger Service Unit attachment	High bending stress + fretting	Service	Internal. Visible part. NDT inspection.	Around 10 both sides	No	No	No
	Fastener holes in web	High bending stress	Service	Internal. Visible part. NDT inspection.	Around 80 both sides	No	No	No
STRINGERS (Fig. 5.2, 5.5, 5.6 of Ref [4])	Fastener holes at Stringer couplings	High load transfer	Test	Internal. Visible part. NDT inspection.	Around 30 both sides	No	No	No
	Fastener holes at frame attachment	High bending stress	Test and Service	Internal. 2nd layer of assembly. NDT inspection	??	No	No	No
CARGO DOOR (Fig. 5.12 of Ref [4])	Fillet radius at hinge fitting	High bending stress	Test and Service	Internal. Visible part. Visual inspection possible.	<10	No	No	No
	Latch spool bolts	High local stress + corrosion	Service	Bolts are removed for NDT inspection	<10	No	Latch cracking resulting from other failures	No
PRESSURE BULKHEADS (Fig. 5.7, 5.9 of Ref [4])	Fastener holes at stiffener attachment to pressure bulkhead	High bending stress	Test and Service	Internal. Visible part. NDT inspection.	<10	No	No	No
	Fastener holes and fillet radius at intercostals and stringers attachment	High tension and bending stress	Test	Internal. Visible part. Visual inspection possible.	50	No	No	No
RIB TO SKIN ATTACHMENTS (Fig. 5.15 of Ref [4])	Fastener holes in stringers, at rib attachment	High tension and bending stress	Service	Internal. Visible part. NDT inspection.	<10	No	Rib web cracks discovered	No

Table 5.1 – Review of In-service and Fatigue Test Results of MED Situations

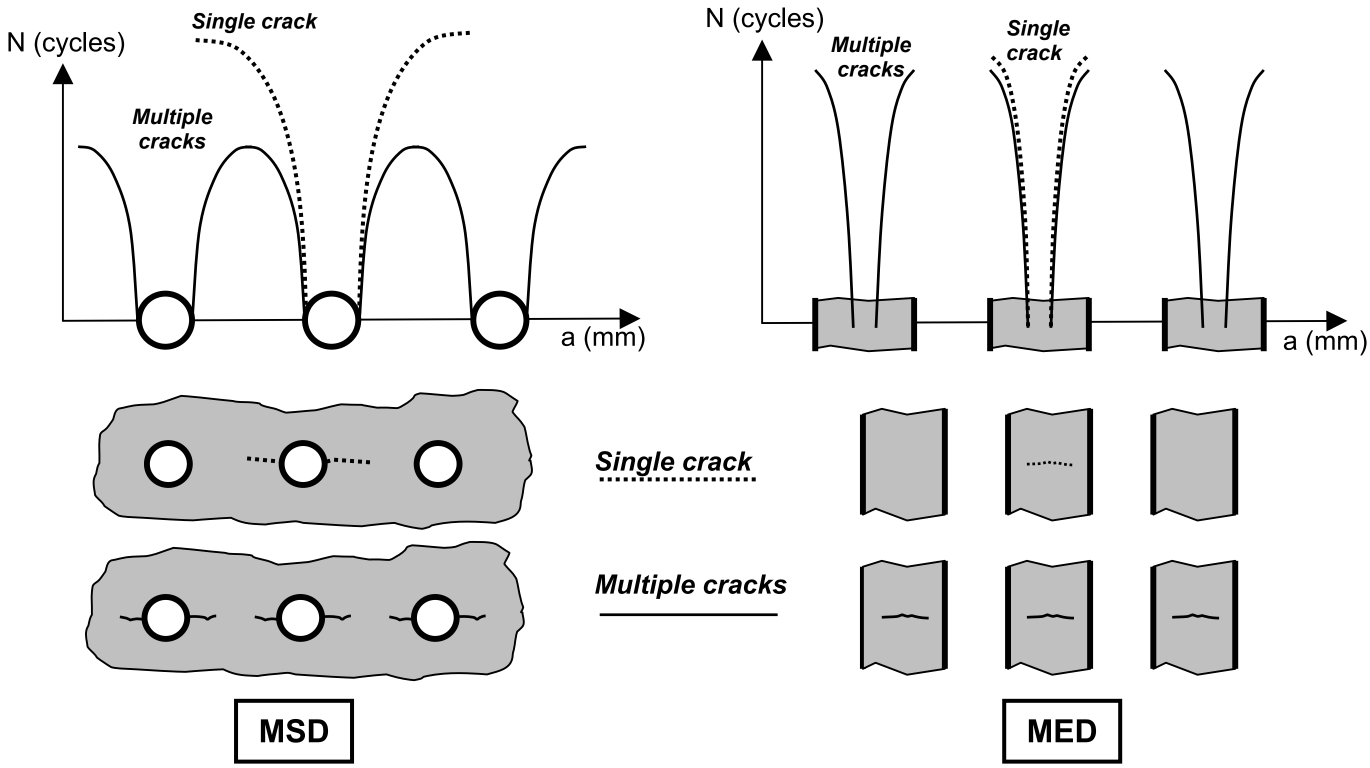

Figure 5.1 – Differences Between Interaction Effects Between MSD and MED

2) Methodology Issues - Applicability of MSD Procedures to MED.

The AAWG determined through a series of Round-Robin example problems that the procedures developed and documented in Reference [4] for MSD are still generally applicable to the MED situation, including the use of probabilistic approaches to determine ISP and SMP. This can be construed to mean that initial flaw size assumptions as well as distributions throughout the structure are definable in a statistical sense.

Further, the application of a Limit of Validity (LOV), Inspection Start Point (ISP) and Structural Modification Point (SMP) as defined in Reference [4] to the MED situation is equally valid. Some adjustments might be necessary to the determination of the ISP because of the less stringent NDI requirements.

On the other side, the determination of failure modes and effects seem not as well defined in the MED case as compared to the MSD case. One of the reasons for this is that crack interaction seems to play a less significant part of the problem for residual strength in the MED case. To this end, the residual strength analysis may need to be done with greater care or conservative analysis stop points may be required, as was done with some MSD approaches. The analytical approach may require one or more of the following:

1. non-linear model using global/local modeling (with iteration of model based on crack length), or
2. Damage states comparable to service or test structural conditions, or
3. a validated conservative approach.

Fatigue tests are no less important in determining potential MED situations or hot spots in the structure. It is always good to remember that observed fatigue test cracks need not always be repaired. Extremely useful data can be obtained by monitoring the crack growth to determine likely failure paths and to determine the amount of load path redistribution as failure progresses.

On the subject of risk assessment as it might apply to managing MSD/MED situations, it was acknowledged that considerable advances had occurred in this area recently. However, additional studies would need to be conducted to establish risk approach capability in this area. Technically the AAWG had not been tasked with this and the rule changes necessary to allow this approach.

The AAWG determined that the discussion contained in Reference [4] concerning the interaction of MSD and MED is still valid. That conclusion was:

> *"The AAWG examined the issue of whether or not it was possible to have a simultaneous occurrence of MSD and MED in a single principal structural element. The AAWG concluded that there was a distinct possibility that this could occur on some details that were equally stressed. This scenario should be considered in developing appropriate service actions for a PSE should this event seem likely.*
>
> *It is suggested that if an area is potentially susceptible to both MSD and MED, then both problems be worked independently. If the thresholds for both MSD and MED indicate a high probability of interaction, then this scenario must be considered".*

3) Necessary Elements of MED Analysis

These statements declared (a) through (g) represent the typical steps that are followed in performing an analysis for MED.

(a) Identify critical design details susceptible to MED.

See Reference [4], Section 5,

(b) Define the WFD condition (*e.g.* number of elements failed).

Identify the structural failure modes for the MED condition, *i.e.* determine the number of elements failed at the point of static instability, or the point at which the residual strength of the structure is degraded below regulatory levels.

The effect of crack interaction on residual strength is less significant in the case of MED than for MSD, and the determination of failure modes is not as well defined as for MSD. Consequently, the residual strength analysis may need to be done with greater attention to detail. An alternative conservative approach would be to terminate the analysis at some point prior to final failure, as has been done in some MSD calculations.

(c) Collect/generate fatigue life data at element level (*e.g.* service inspection findings).

Assemble data that characterize the fatigue life of the element, such as the results of inspections of the fleet, if available.

These data may consist of a variety of different information, such as damage locations, directions, sizes and time distributions. Consequently, there are a range of approaches that may be used in interpreting these data, *e.g.*

1. Consider the inspection results as either cracked or uncracked (null findings), taking no account of crack length information.
2. Adjust the crack length inspection results to some datum crack size, such as initiation crack size, the detectable crack size, or the critical crack size. This may require extrapolation of some inspection results up to the datum, and back calculation for existing cracks greater than the datum. Uncracked locations may be assumed as crack free (*i.e.* suspended or censored data), or as having a crack below the detectable size. Exclusion of suspended data is conservative.

Where no fleet data exists, an applicant will need to characterize the fatigue life of the element from fatigue data based on coupon test results representative of the loading conditions existing in the airplane.

(d) Establish statistical model at element level (*e.g.* PDF for life to detectable crack).

Using the data collected in (c), or other suitable data from test and/or service experience, establish a statistical model that characterizes the element fatigue life.

(e) Establish statistical model at airplane level (*e.g.* PDF for life to WFD condition).

Using the model developed in (d) and the WFD condition defined in (b), establish a statistical distribution for life to failure at the airplane level.

The assumed sequence of cracking can significantly affect this calculation, since the ability of a multiple element structure to tolerate damage is reduced when two adjacent elements are cracked. However, the likelihood of cracks developing in adjacent elements depends on the scatter in the statistical distribution of expected failures. Because of the uncertainty in this analysis, it is recommended that adjacency is enforced, *i.e.* it is assumed that, following crack initiation in an element, the next crack to initiate occurs in an element adjacent to the first cracked element.

(f) Determine Inspection Start Point (ISP).

Using the distribution developed in (e), and appropriate factors to address fleet variability, determine the ISP.

The ISP may be based on initiation probabilities, as in the existing AC guidance material, or on the detectable average behavior. The actual methodology is dependant on assessment procedure.

Where an inspection program is impractical (see Reference [4], Figure 4.4.3), "the only recourse would be to modify the structure before significant cracking occurs in the fleet. Where no other data exists, dividing the average behavior by a factor of three to determine the SMP may be used.

(g) Determine Structural Modification Point (SMP).

Using the distribution developed in (e), and appropriate factors to address fleet variability, determine the SMP.

There should only be a limited number of elements cracked at the SMP (*c.f.* the sparse crack array for MSD). Consequently, the SMP in the case of MED should be defined to ensure that only limited cracking is expected to occur on some airplanes in the fleet, such that the MED will not significantly reduce the residual strength capability of the structure.

In establishing the SMP, the MED scenario should not be combined with other possible 'local' damages, such as the accidental damage, environmental degradation or fatigue damage of conventional damage tolerance assessments, as the possibility of such a combination is considered to be remote. However, it should be subsequently demonstrated that the structure retains LDC in the presence of the state of cracking likely to occur at the SMP.

Figure 5.2 shows a generic application of steps (b) through (g) of the process.

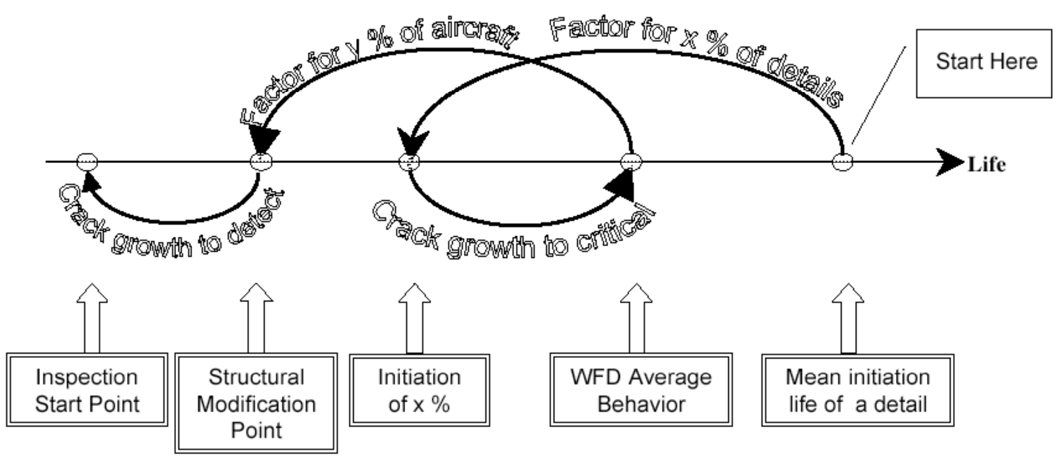

Figure 5.2 - Generic Process to determine ISP and SMP for MED

4) Damage scenarios to be considered.

The AAWG made a determination that the damage scenario assumed at SMP is critical to the results of the analysis. In other words, the condition assumed for residual strength can materially affect the outcome of the problem. The AAWG adopted the following failure model to use in the round robin problems:

State at SMP - A percentage (a%) of the elements failed, on a percentage (b%) of the airplanes in the fleet. As for MSD, the SMP for MED should be defined to ensure that only limited cracking is expected to occur on some airplanes in the fleet. Consistent with this, the WFD condition should only exist in 5% or less of the fleet. This should ensure that the MED damage will not reduce the residual strength capability in the presence of other damage significantly.*

* Dependant on statistical model used. Log-normal is nominally 2%, Weibull is 5%, other models vary accordingly and is based on equivalency of protection to a two lifetime fatigue test for aluminum structure

Other considerations:

1. *Any inspection task in place between ISP and SMP to detect possible cracking should ensure that cracking is found and repaired prior to element failure.*

2. *The apparent rate of development of cracks in adjacent members (i.e. scatter of the distribution e.g. high alpha) in coming up with maintenance program recommendations*

3. *Consideration should be given in establishing the condition at SMP, e.g. shell instability, buckling i.e. failure modes other than fracture.*

4. *In the approach used to establish the SMP, a study should be made to demonstrate that the approach ensures that the expected extent of MED at the SMP still has a LDC to address damage from sources such as accidental damage, fatigue damage, or environmental degradation.*

5) Technical Issue – Adjacency of Initiated Cracks

The AAWG, in the process of addressing the subject of MED, identified one additional issue that was deemed significant, that of the probability that cracks might develop adjacently. The question of the likely hood of cracks developing in adjacent elements of a multi-element structure is a statistically interesting problem. The problem simply stated is - given a statistical distribution of expected failures, what is the probability that following the first crack initiating in an element, that the very next crack to initiate occurs in an element adjacent to the first cracked element? This problem is interesting because when two adjacent elements are cracked, the ability of the structure to tolerate large damage is reduced.

The AAWG ran a Monte-Carlo analysis and examined the results to determine if the issue of adjacency caused significant variance in the results.

The problem considered was a row of frames all containing an identical fatigue detail with fairly low life. The basic assumptions used in the analysis were as follows:

- Alpha ranging from 4 to 8;
- Beta = 120,000;
- 100 frames per airplane;
- 1,000 scenarios run;
- Investigation of the number of frames initiated and their location when 1st frame failed

Results are presented for an average airplane (fleet variability was not taken into account)

Figure 5.3 shows the expected probability density function (PDF) for the various alphas assumed. Figure 5.5 shows the expected state of the frames when the first frame fails. It says that for alphas between 4 and 8, there is a 50% probability that there will be from 10 to 20 other frames cracked when the first frame fails. This is without regard to whether the frames are adjacent or not.

Figure 5.4 takes a first look at adjacency issues. Based on this chart and averaging the data from the alphas, the data says that there is approximately a 75% chance that there will be no adjacent frames cracked at first frame failure. In Figure 5.5, there is a 20% chance that there will be one adjacent frame initiated and a 5% chance that two adjacent frames are initiated.

Figure 5.6 summarized the results of the investigation in terms of what might be expected at WFD Average Behaviour. Even though there is an expected 20% chance of having an adjacent frame initiated when the first frame is failed, there is less than a 1.5% chance of this happening at WFD Average Behaviour. This result is independent of Alpha.

Since the analysis process is not exact, certain areas of the structure may behave differently than expected based on stress levels and design configuration. Because of these situations, the AAWG strongly recommends that an applicant choose to enforce adjacency in his analysis.

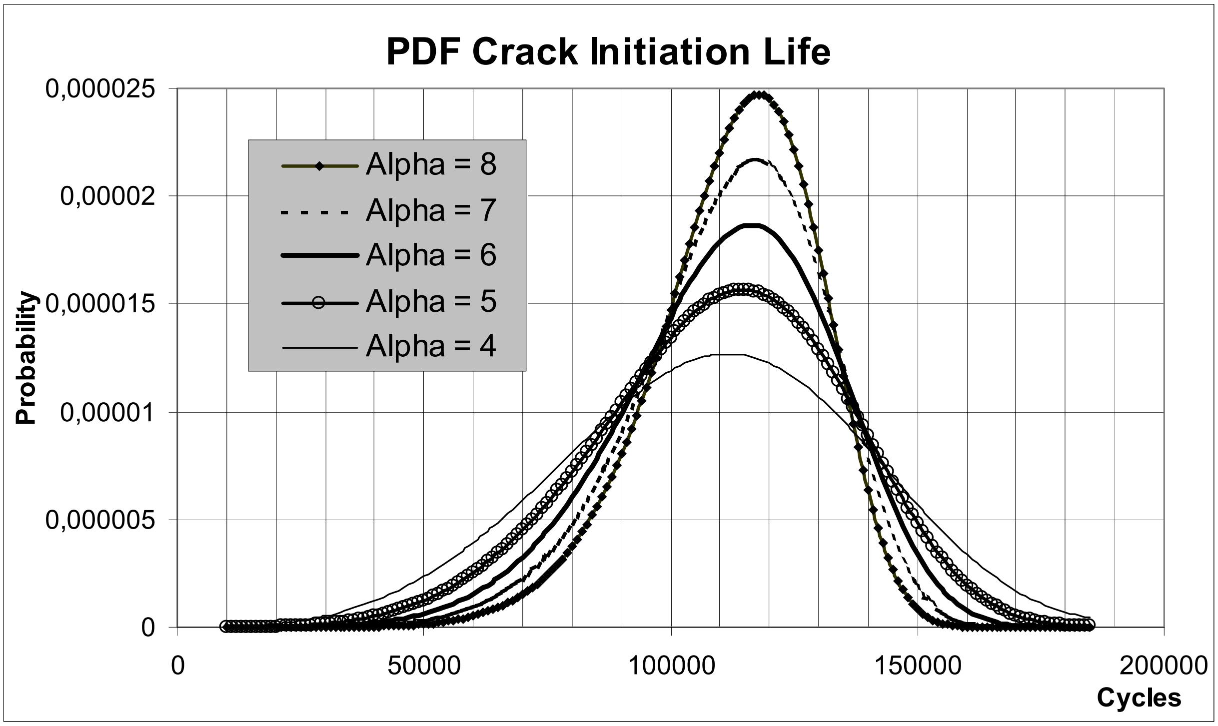

Figure 5.3 – Probability Density Function - Detail Crack Initiation Life Vs. Alpha

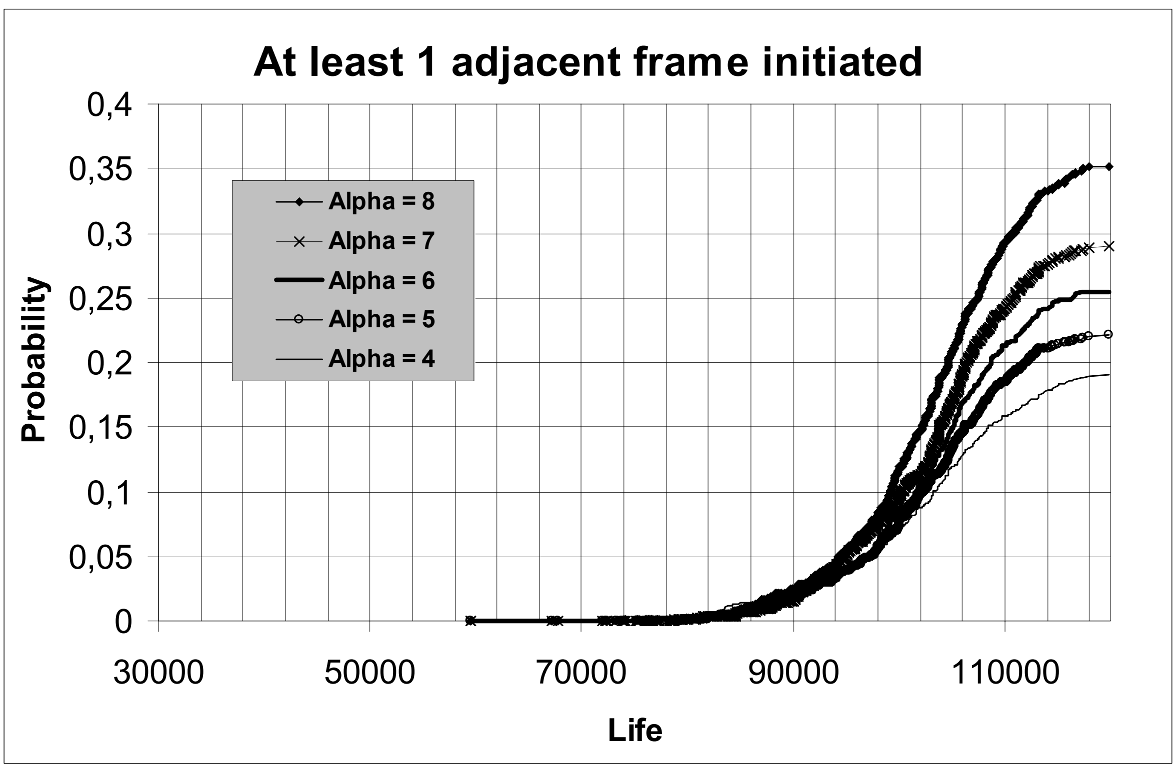

Figure 5.4 - The total number of frames initiated when the 1st frame failure occurs (without consideration of adjacencies)

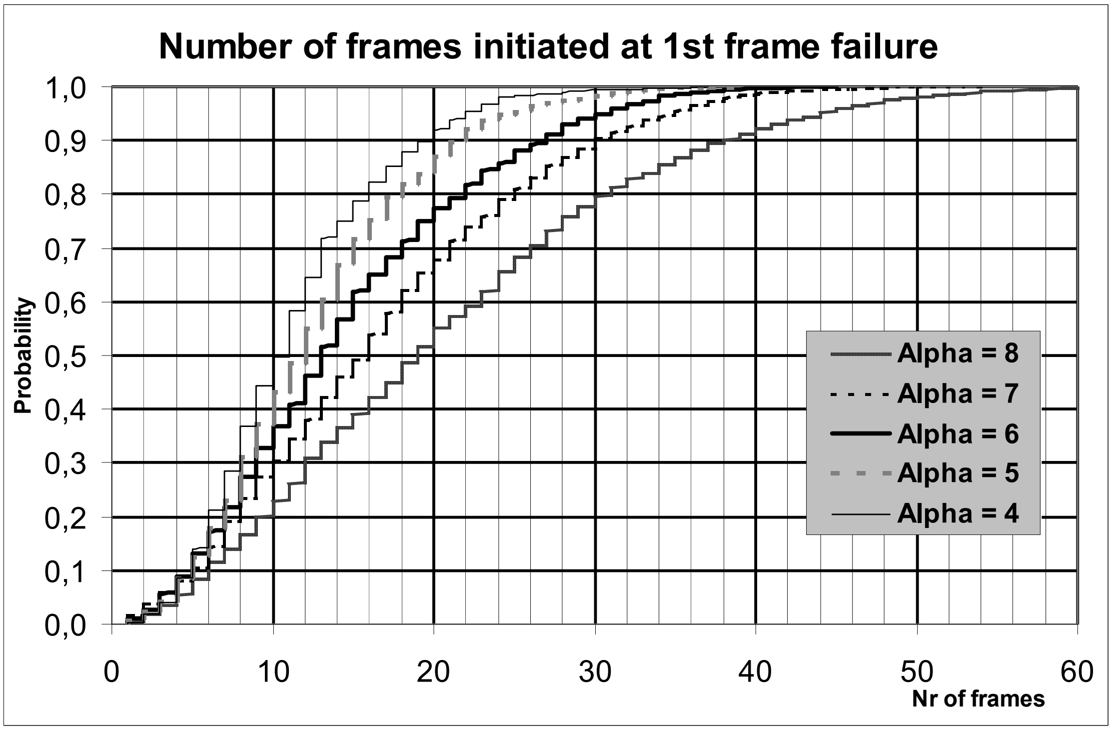

Figure 5.5 – Number of adjacent frames initiated at first frame failure

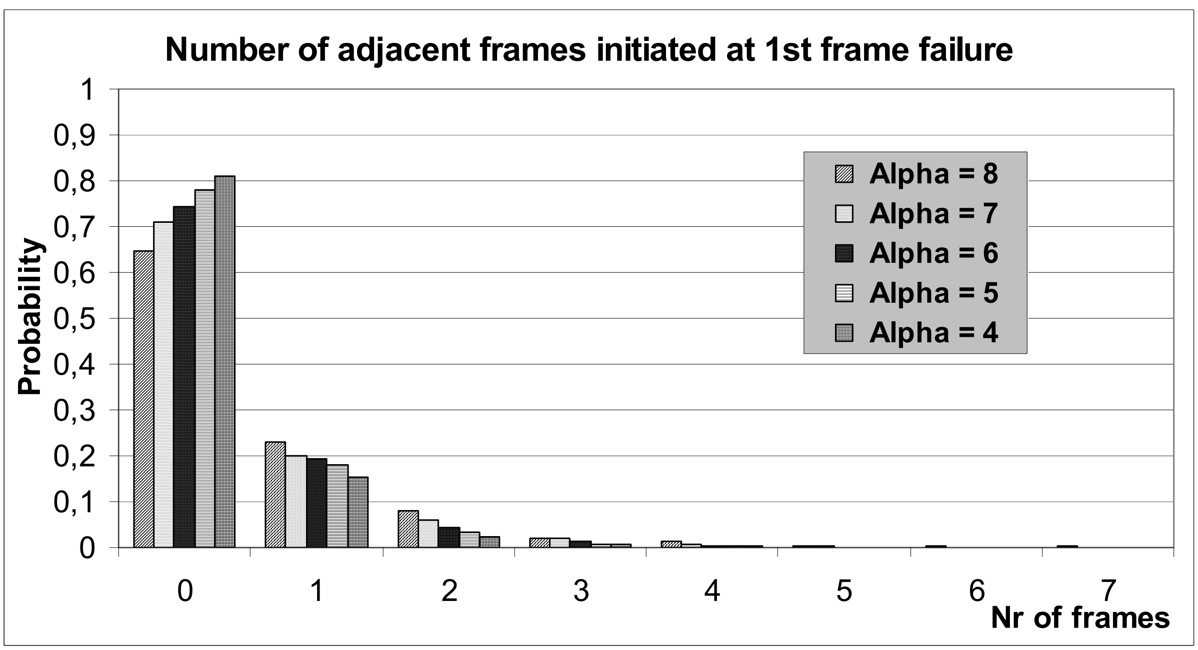

Figure 5.6 – Probability of Having At Least One adjacent Frame Initiated at First Frame Failure Vs. Alpha.

C. MED Round Robin Example Problems

Three MED round robin problems were circulated for each of the participants to consider. The first was a “public” MED round robin where each of the participants solved the same problem, the second, was a private MED round robin where each presented solutions to problems that had occurred in service. The last MED round robin was another “public” MED round robin where each participant used a provided set of data from an in-service MED problem. For the first and third MED round robins, the raw data is presented in Appendix E. The actual problem results are excluded so that other applicants can use these problems to validate their individual procedures.

The first MED round robin was a simple example of a number of frames with a single similar open hole in each frame. Material properties were defined as well as some failure criteria. The purpose of the first MED round robin was to exercise the statistics used and determine where differences existed. The participants agreed to use the same statistical procedures defined in the final report to Task 5 Reference [4].

For the first round robin, it was mutually agreed that the following six issues would be examined:

1. To what degree can the methodology account for variations in fastener type and build standard for determination of when cracking starts?

2. When does load redistribution occur from the failed part to the remaining structure? When is it significant to cause interaction?

3. What are the significant issues that affect the analysis results from the various approaches?

4. Is an ISP viable for MED?

5. What is the significance of test and service data in validating the MED results?

6. We want to understand how the problem answers vary at a few different end points.
   - At a single non-interacting crack, progressive failure to limit load residual strength, may need to look at LDC to postulate failure.
   - Simultaneous frames cracked, go to failure at limit load or LDC requirements.

1) MED Round-Robin Number One Discussion

The discussions that followed the first round robin revealed a number of issues that were not apparent when the problem was formulated. The ground rules for the problem were redesigned and a second attempt was made to solve the problem. The changes in the initial assumptions are documented in Appendix E. A study of the results of the first round-robin indicated that:

1. To the extent that the baseline data for the detail characterizes the build process, it can be expected that the results of the problem reflect such things as fastener fit, etc.
2. Examination of other related data indicated that load redistribution did not occur before there was load path failure. This is quite different than the MSD case where significant redistribution of load is expected as the individual cracks grow.
3. The single most important variable in the analysis is the assessment of the state at SMP.
4. From the results of the analysis, it appears that the methodologies documented in Reference [4] show good promise as being applicable to the MED situation.

2) Discussion of Issues Concerning Data Characterization MED Round-Robin Number 3

A significant issue that became apparent during the third MED round-robin is that there were a variety of methods used to characterize the data set. It should be pointed out that this would only be an issue where a fleet of airplanes is operated well into where MSD or MED might occur. There were five different approaches identified and they are documented below. Please note that the AAWG does not endorse any method. This is simply a summary of approaches that led to reasonable answers.

Five different approaches:

1. Simply consider the data as Cracked (1) / Non-Cracked (0), taking benefit of non-cracked results. No consideration of crack length information.
2. Extrapolation of inspection results up to crack initiation (back calculation for existing cracks). Assume no cracks either crack free or undetected.
3. Extrapolation of inspection results up to detectable crack size (back calculation for some existing cracks). Assume no cracks either as crack free or as a crack < detectable size (not detected).
4. Extrapolation of inspection results up to critical crack size. Assume no cracks either crack free or undetected.

5. Extrapolation of inspection results up to a critical size and assumed some of the frames failed before the inspection but above a threshold time with a range of cracks above critical length. Exclusion of suspended data will provide a conservative result

D. Authorities Review Team Assessment of MED Round Robin Data.

The Authorities Review Team (ART) is an ad hoc group of regulators from the FAA and JAA who have been enlisted to review and critique the round-robin results. In the review, the ART critique of the various methodologies is aimed at creating a deeper understanding of how MED problems are handled at the OEMs. The ART is composed of:

1. John Bristow (Chair), CAA-UK (JAA)
2. John Van Doeserlaar, CAA-NL
3. Brent Bandley, FAA
4. Bob Eastin, FAA

The AAWG has found that the execution of round robin problems especially helpful in clarifying, understanding and standardizing some parts of the approach. Following the review of the first two MED round robin example problems, the ART issued a series of comments and questions to the AAWG. Specific questions were also handed to each participant concerning their individual work done in the private round robin, Round Robin Number 2. Overall, the approaches reviewed appear to give a safe approach to developing maintenance programs for the preclusion of MED, provided that the points below can be satisfactorily answered.

The ART issued seven comments and observations from the first two MED round robin example problems:

ART Comment or Observation	AAWG Response
1. It is worth noting that in the three private Round Robin presented: a. Each one resulted in modification action well in advance of the DSG: and that b. An acceptable and justifiable generic incorporation time needs to be established for aircraft beyond SMP.	See Section 8.A, 8.B
2. The ART believes, based on reviewing the round-robin problems that that the following issues are significant to the results of the analysis. a. The assumed sequence of cracking can significantly affect the inspection interval b. The sequence in which crack growth is added to the initiation behavior seems to influence the final answers.	See Section 8.C
3. For actual design features, the problem is difficult to solve without fleet and/or test data - a way needs to be found and the process outlined.	See Section 8.D
4. Agreement and rationale need to be established for use of 1%, 2%, and 5% probabilities for both detail and aircraft fleet level. *Should the management level be 2% or 5% for SMP?* a. The acceptable extent of cracking / residual strength capability at SMP needs to be defined in some way b. 1 frame versus 2 frame - conduct a review of some real data Boeing and Delta data c. Should a "1 inch crack/link-up" equivalent be established for MED	See Section 8.E
5. The direction given in Reference [4] is not always followed: a. ISP is derived from the detectable average behavior. The AC says it should be based on initiation probabilities b. Inspection intervals are not 1/4 ISP to SMP c. WFD ave is not always established	See Section 8.F
6. It needs to be clearly understood that the extent of cracking at SMP will be small [c.f. the sparse array for MSD] and operators must be clear that all aircraft will need to be modified by SMP not just the cracked ones.	See Section 8.G
7. Consider assigning a probability level to ISP and SMP with respect to fleet distribution	See Section 8.H

Table 5.2 – ART Comments and Observations

6.0 LIMIT OF VALIDITY

A. What is the Limit of Validity

The Program that the AAWG developed contains two distinct issues to be addressed:

1. A Limit of Validity (LOV) of the Maintenance Program
2. A Maintenance Program to ensure WFD will be precluded within the LOV of the maintenance program

Depending on whether or not you are certifying a new airplane or a currently certified airplane, the definitions for LOV are worded slightly differently but they have the same overall objective.

In the certification domain, the LOV is the period of time, expressed in appropriate units (e.g. flight cycles), for which it has been shown that the established inspections and replacement times will be sufficient to preclude development of wide spread fatigue damage.

In the operation domain, the LOV is the point in time in flight cycles or hours where additional inspections and/or modification/replacement actions must be incorporated in to the operators maintenance program in order to continue operation.

LOV designates the extent to which the design data has been duly substantiated and represents an operational limit based on the engineering data that supports the maintenance program. Therefore, all identified service actions are required for operation up to LOV.

For instance, there is or will be a statement included in the Airworthiness Limitation Section to the effect *"the maintenance manual is substantiated for 42,000 flights."* LOV is an airplane level number.

Before the LOV is reached there may well be several maintenance actions for WFD identified by component specific ISPs and SMPs. The maintenance actions for WFD and LOV are independent. LOV is the end of the substantiating data road, the maintenance actions required before LOV are for the preclusion of WFD up to the LOV.

Any LOV extension requires additional fatigue test evidence and validation of the maintenance program for efficacy against WFD and other fatigue damage.

Under the proposed rule for WFD, the concept of LOV is a regulatory requirement.

B. Data Required to establish a LOV

The process used to establish a LOV requires data that extends the fatigue test evidence. The AAWG looked at conditions to be met in defining and extending the LOV for in-service airplanes.

The defining and moving of the LOV for in-service airplanes involves four independent tasks.

The first task is to ensure that the basics of the aging airplane program are in existence. This means that the following programs are active and are achieving the desired program goals:

- Mandatory Modifications
- Corrosion Prevention and Control
- Pressure Boundary Repair Assessment
- Supplemental Structural Inspections or Airworthiness Limitations

In addition, all currently known structural airworthiness issues, including WFD, have been recognized and service actions have been initiated under existing applicant processes.

The second is the collection of data necessary to extend fatigue test evidence. Fatigue Test Evidence consists of reductions of data collected from more than one of the following sources:

- Full Scale Fatigue Test with or without tear down
- Full Scale component tests with or without tear down
- Tear down and refurbishment of a high time airplane
- Less than full scale component tests
- Fleet Proven Life Techniques
- Evaluation of in-service problems experienced by other airplanes with similar design concepts
- Analysis methods which have been parametrically developed to reflect fatigue test and service experience.

Normally this data is airplane level data and does not reflect on any detail or component level behavior. The data collected can be used in the applicant's methods and procedures to predict a new LOV (e.g. LOV_2). In some cases, data may not exist for a component or area of the structure. In this case, the applicant may want to consider the collection of additional data as a conditional requirement before any particular airplane is allowed to operate beyond the initial

LOV. Detailed teardown and refurbishment inspections are particularly effective in these conditions. Sufficient data is required to establish that WFD will be precluded to a high degree of confidence.

Third, a formal analysis of the structure for MSD/MED, done in agreement with Advisory Circular 91-56C (to be published), is required to establish specific maintenance actions for MSD/MED. This analysis predicts when MSD and MED is likely to occur and the maintenance programs required (e.g. ISPs and SMPs) to preclude the occurrence of widespread fatigue damage. During this analysis, it may be determined that additional experimental and service data is required to support analyses (tests, tear-down of retired high time aircraft).

Fourth, maintenance documents will need to be created/updated to include maintenance actions (e.g. inspections (ISP, RI), and modifications (SMP)) for those areas where it has been predicted that MSD/MED will occur before the newly established LOV (e.g. LOV_2). The ALI will also need to be updated with LOV_2.

Subsequently when airplanes reach LOV_2, another similar process should be followed to establish LOV_3. There are some important differences however. First, the MSD/MED analysis done for LOV_2, should still be applicable following review of any specific in-service findings. The structural modifications, as a result of airplanes reaching an SMP during the period from LOV_1 to LOV_2 will need to be evaluated for additional maintenance actions necessary to achieve LOV_3.

Figure 5.7 gives a notional presentation of this subject.

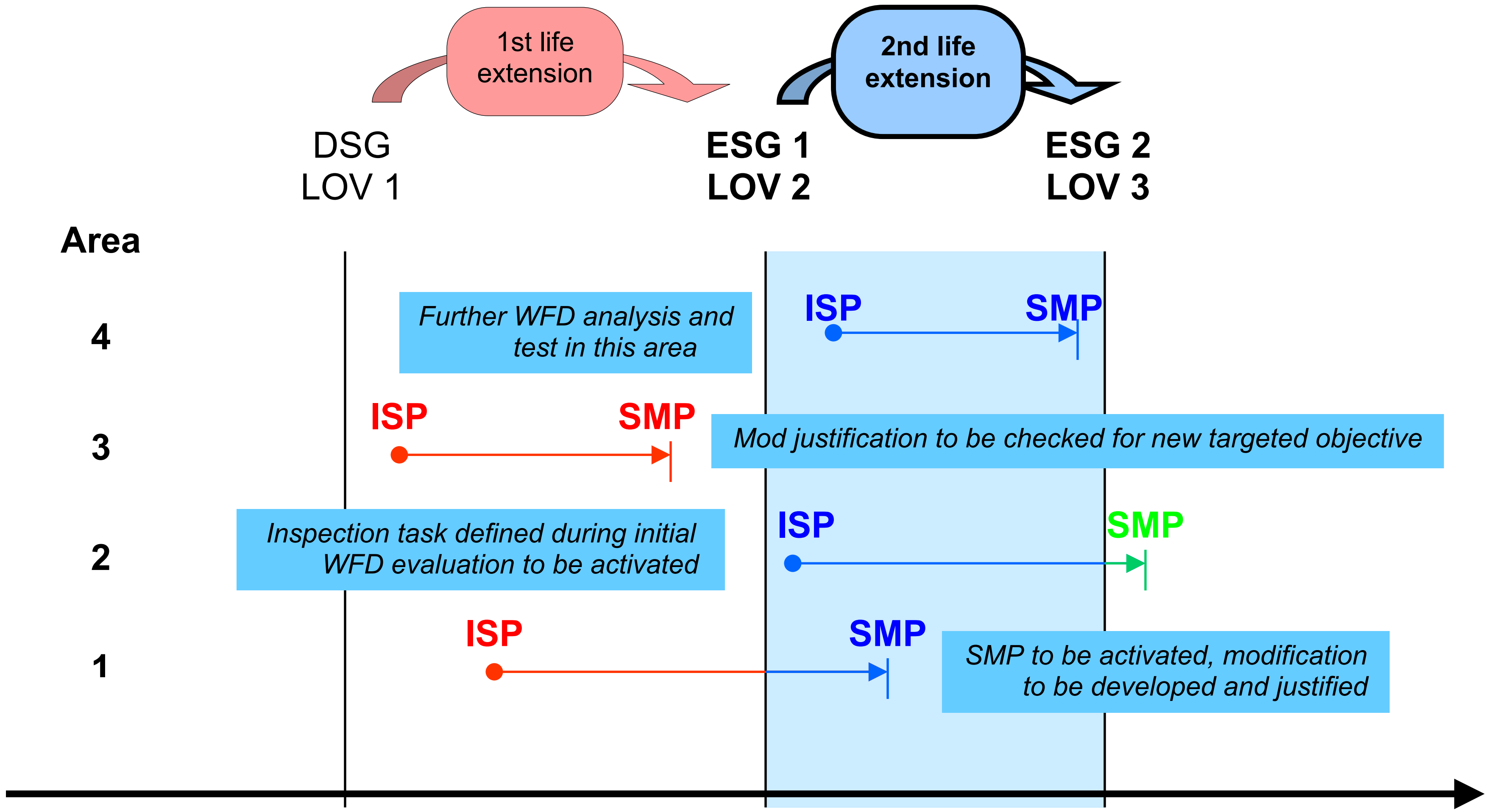

Figure 6.1 – Process to Move LOV

7.0 BRIDGING TASK C – NDI ROUND ROBIN

Residual strength reductions due to multiple site damage scenarios require appropriate measures in order to maintain the structural integrity over the period of planned flight cycles. Among other measures, improved and advanced NDI technologies may provide potential for detection of MSD. Significant improvements in comparison with the currently available NDI technologies are expected from using the following technologies and computer software algorithms:

- Semi-automatic crack detection systems (manually operated probe systems with fully automated signal pattern evaluation)
- Improved multiple frequency eddy current systems
- SQUID sensor technology

All of the technologies mentioned above already exist today and have entered into advanced field trials. Further information on each of these technologies is given below. In order to fulfill the requirements for detection systems capable of reliably resolving the cracks associated with MSD, the improved NDI technologies must provide:

- A significant improvement in resolution capacity (20 to 40% over today's capability)
- Low false call rates (<1%)
- A reduction of the human factors element
- Semi-automatic signal pattern evaluation

To this end, the AAWG requested and the FAA Technical Center agreed to perform two round robin trials to investigate some of these areas. The results of these studies that included two round-robin trails are documented in a separate, yet to be published, report, Reference [5].

For the purposes of documentation of these studies, the two round robins consisted of the construction and evaluation of the small coupon specimen detailed in Appendix E subpart C, and a set of simulated highly characterized lap join specimens with natural fatigue cracks of many lengths and directions. The FAA Technical Center was asked to evaluate the following specific issues:

- Baseline Current NDI Capabilities.
- Identify new emerging NDI Technologies for detecting small cracking typical of MSD/MED situations.

8.0 OTHER TECHNICAL ISSUES

During the review of the round robin problems the ART raised a number of technical and programmatic issues. These issues were documented in Table 5.2. The following subsections represent the AAWGs response to those issues

A. SMP Below DSG

The ART Observed that in the three private Round Robin presented, each one resulted in modification action well in advance of the DSG.

The AAWG acknowledges that this is a clear possibility especially with the older airplanes. Situations could exist today where the SMP is below the DSG. Appropriate service actions must be put in place. That process should include at least the three following steps:

1) An exploratory inspection program of the fleet leader airplanes.
2) Upon verification that the situation exists appropriate service action should be extended to other airplanes in the fleet.
3) It is expected that the Regulatory Authority will promptly execute an Airworthiness Directive that mandated the action.

B. Airplanes Beyond SMP

An acceptable and justifiable generic incorporation time needs to be established for aircraft beyond SMP.

The AAWG believes that there is a possibility that this will happen in a few circumstances. In this case, the applicant should follow the recommendations contained in 1) above to establish appropriate service actions and repair any airplane found cracked. The remaining airplanes that are not cracked and are above the SMP when the modification becomes available should be given the option to continue to inspect for a period of time not to exceed the next major scheduled down time or two years whichever is greater.

C. Variation in Methodologies

The ART believes, based on reviewing the round-robin problems that the following issues are significant to the results of the analysis.

1) *The assumed sequence of cracking can significantly affect the inspection interval*

2) *The sequence in which crack growth is added to the initiation behavior seems to influence the final answers.*

The assumed sequence of cracking can affect the inspection interval. This is probably more an issue with MED situations than MSD. The AAWG recommends that the crack growth interval chosen to determine repeat intervals is based on a model that assumes that adjacent cracks develop. This would develop the most conservative crack growth scenario and provide the smallest repeat interval.

The AAWG acknowledges that there is some variation within the different approaches on how crack growth is added to determine WFD Average Behavior. One approach adds the crack growth before factoring, another adds the crack growth during a Monte Carlo Simulation and a third adds a portion of the crack growth after factoring. The AAWG has concluded that these variations, within the context of each methodology, are reasonable and do not adversely affect or produce unconservative results. It should be pointed out that any particular method of analysis is subject to regulatory review and approval.

D. The Need for Fleet Data to Support Analysis

For actual design features, the MED problem is difficult to solve without fleet and/or test data - a way needs to be found and the process outlined.

The AAWG agrees. There will be cases where no fleet data or fatigue test data is deemed applicable to the situation under consideration. In these cases it is incumbent on the applicant to provide a conservative estimate of the detail or element fatigue life using coupon fatigue test results and/or fatigue S-N diagrams appropriately adjusted for the loading state in service. This is discussed in Section 5.B.3)(c).

E. Probability Analysis Basis

Agreement and rationale need to be established for use of 1%, 2%, and 5% probabilities for both detail and aircraft fleet level. Should the management level be 2% or 5% for SMP?

The AAWG has reviewed this issue and has concluded that the main issue here is the statistical model used by the applicant. Based on equivalency, an applicant would use a failure rate of 2% for log-normal and 5% for Weibull. These both provide the same apparent level of protection given by a two-lifetime fatigue test. With respect to SMP and the total estimated probability in the fleet to the defined WFD cracking scenario should not exceed 5%.

F. Extent of Cracking

The acceptable extent of cracking / residual strength capability at SMP needs to be defined in some way

1) *1 frame versus 2 frame -- conduct a review of some real data Boeing and Delta data*
2) *Should a "1 inch crack/link-up" equivalent be established for MED*

The AAWG agrees that the state of damage at SMP needs to be defined. This is however dependant on the design of the structure and the AAWG feels that it this discussion is best left to one between the applicant and his regulator. It is important that the results of the MED analysis are reasonably conservative.

G. OEM Methodology

The direction given in Reference [4] is not always followed:

1) *ISP is derived from the <u>detectable</u> average behavior. The AC says it should be based on <u>initiation</u> probabilities*
2) *Inspection intervals are not 1/4 ISP to SMP*
3) *WFD ave is not always established*

The AAWG agrees. The Reference [4] material was offered as a guide to one way to solve the problem, not the only way. The execution of five round robin problems, two for MSD and three for MED, by as many as four different agencies, all using somewhat different methodologies have all demonstrated results which are acceptable for the development of maintenance programs that are effective to preclude MSD and MED. The purpose of presenting the methodology aspects in the Reference [4] report was to define the problem bounds and expectations. The means to achieve those bounds and expectations should be left up to the applicant and his regulatory authority.

With regards to the Inspection intervals being 1/4 of the time between ISP and SMP, it is true that that is what is shown in figure 4.2.2 (Reference [4]). However there is no specific requirement for a factor of 4. This factor will be agreed to in discussions between the applicant and his regulatory authority.

H. Sparse Array

It needs to be clearly understood that the extent of cracking at SMP will be small [c.f. the sparse array for MSD] and operators must be clear that all aircraft will need to be modified by SMP not just the cracked ones.

The AAWG still believes this to be the case. The extent of cracking in the fleet is expected to be small and with the inspection program, no crack will ever reach a critical length. Furthermore, no airplane should be allowed to fly past the detail specific SMP without modification. This is a necessity, since allowing airplanes to fly past the established SMP would create a safety situation that would be very difficult to manage and maintain airworthiness.

9.0 CONCLUSIONS

The AAWG reached the following conclusions as a result of this tasking.

1. The areas designated as susceptible to MED, and documented in Reference [4], are still valid and are inclusive of the situations found in-service and test.
2. The identification of the failure scenario for SMP is a critical element in defining the MED problem and may involve other failure modes than static or fatigue overload.
3. The subject of the development of adjacent cracks for MED situations was studied and while it was determined that there was only a small probability of this happening at an SMP, adjacency should be enforced for conservatism.
4. Typically, there is no crack interaction in MED situations, however load redistribution should be considered when load path failure occurs.
5. The MED round robins examined several methods with probabilistic elements that appear to give valid and conservative approaches to the establishment of maintenance programs for MED and were effective in defining important parameters in the analysis. The MED round robin demonstrated that the industry was capable of performing the necessary assessments
6. The methodology and procedures outlined in Reference [4] on MSD are generally applicable to evaluating MED situations. Industry is well prepared to perform the analysis.
7. The application of risk assessment methodology for the development of maintenance programs for WFD would require significant changes in the regulations and significant validation that is currently beyond industry capability.
8. The implementation of maintenance programs for WFD is not dependant on the development of new NDI procedures, however more efficient means of inspecting large areas would be desirable.
9. The concept of ISP, SMP, LOV and normal maintenance is still valid for management of MED situations. Other than those concepts already considered for MSD, there are no additional maintenance requirements for the management of MED.
10. Although there has been a high level of safety achieved through implementation of the existing aging airplane programs, rulemaking is still needed to implement programs for the prevention of WFD.

10.0 RECOMMENDATIONS

.
The AAWG reached six recommendations:

1. With regards to the risk analysis approach, additional studies are recommended to demonstrate the capability of the approach. These studies will lead to a foundation upon which new rules could be crafted for compliance.
2. The AAWG reviewed the capability of the industry to perform probabilistic based analysis of the MED situation and has found that sufficient maturity of the procedures exist to recommend that analysis can be used for development of effective maintenance programs.
3. In performing the MED analysis, the AAWG recommends that the condition of adjacency be enforced unless there is a compelling reason not to do so.
4. The AAWG recommends that no airplane should be allowed to fly past the detail specific SMP without modification. This is a necessity, since allowing airplanes to fly past the established SMP would create a safety situation that would be very difficult to manage and maintain airworthiness
5. The AAWG recommends that the operational rules for WFD proposed for 14 CFR Part 121, 135 et al and the certification rules proposed for 14 CFR Parts 25 be given the highest priority within the FAA for promulgation.
6. The AAWG recommends that the industry support the FAA to see that there is a timely publication of the necessary rules for WFD.

APPENDIX A – FAA/ARAC TASK 5 and 6 –AAWG

TASK 5: DEVELOP TECHNICAL POSITION RE: WIDESPREAD FATIGUE DAMAGE

PAGE: 62 FR 45690 NO. 167 08/28/97

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Aviation Rulemaking Advisory Committee; Transport Airplane and Engine

Issues—New Task

AGENCY: Federal Aviation Administration (FAA), DOT.

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

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

FOR FURTHER INFORMATION CONTACT: Stewart R. Miller, Manager, Transport Standards Staff, ANM-110, FAA, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Ave. SW., Renton, WA 98055-4056, telephone (425) 227-2190, fax (425) 227-1320.

SUPPLEMENTARY INFORMATION:

Background

The FAA has established an Aviation Rulemaking Advisory Committee to provide advice and recommendations to the FA 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 of the FAA's commitment to harmonize its Federal Aviation Regulations (FAR) and practices with the aviation authorities in Europe and Canada.

One area ARAC deals with is Transport Airplane and Engine Issues. These issues involve the airworthiness standard for transport category airplanes in 14 CFR part 25, 33, and 35 and parallel provisions in 14 CFR parts 121 and 135. The corresponding European airworthiness standards for transport category airplanes are contained in Joint Aviation Requirements (JAR)-25, JAR-E and JAR-P, respectively. The corresponding Canadian Standards are contained in Chapters 525, 533 and 535 respectively.

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:

FAR/JAR 25 Aging Aircraft

1. ARAC is tasked to review the capability of analytical methods and their validation; related research work; relevant full-scale and component fatigue test data; and tear down inspection reports, including fractographic analysis, relative to the detection of widespread fatigue damage (WFD). Since aircraft in the fleet provide important data for determining where and when WFD is occurring in the structure, ARAC will review fractographic data from representative "fleet leader" airplanes. Where sufficient relevant data for certain airplane models does not currently exist, ARAC will recommend how to obtain sufficient data from representative airplanes to determine the extent of WFD in the fleet. The review should take into account the Airworthiness Assurance Harmonization Working Group report "Structural Fatigue Evaluation for Aging Aircraft" dated October 14, 1993, and extend its applicability to all transport category airplanes having a maximum gross weight greater than 75,000 pounds.
2. ARAC will produce time standards for the initiation and completion of model specific programs (relative to the airplane's design service goal) to predict, verify and rectify widespread fatigue damage. ARAC will also recommend action that the Authorities should take if a program, for certain model airplanes, is not initiated and completed prior to those time standards. Actions that ARAC will consider include regulations to require Type Certificate holders to develop WFD programs, modification actions, operational limits, and inspection requirements to assure structural integrity of the airplanes. ARAC will provide a discussion of the relative merits of each option.
3. This task should be completed within 18 months of tasking.

ARAC Acceptance of Task

ARAC has accepted this task and will assign it to a working group. The working group will serve as staff to ARAC to assist ARAC in the analysis of the assigned task. Working group recommendations must be reviewed and approved by ARAC. If ARAC accepts the working group's recommendations, it forwards them to the FAA and ARAC recommendations.

Working Group Activity

The working group is expected to comply with the procedure adopted by ARAC. As part of the procedures, the working group is expected to:

1. Recommend a plan for completion of the task, including rationale, for FAA/JAA approval within six months of publication of this notice.
2. Give a detailed conceptual presentation of the proposed recommendations, prior to proceeding with its work.
3. Provide a status report at each meeting of ARAC held to consider Transport Airplane and Engine Issues.

Participation in the Working Group

The working group will be composed of experts having an interest in the assigned task. A working group member need not be a representative of a member of the full committee.

An individual who has expertise in the subject matter and wishes to become a member of the working group should write to the person listed under the caption FOR FURTHER INFORMATION CONTACT expressing that desire, describing his or her interest in the task, and

stating the expertise he or she would bring to the working group. The request will be reviewed by the assistant chair, the assistant executive director, and the working group chair and the individual will be advised whether or not the request can be accommodated.

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

Meetings of ARAC will be open to the public, except as authorized by section 10(d) of the Federal Advisory Committee Act. Meetings of the working group will not be open to the public, except to the extent that individuals with an interest and expertise are selection to participate. No public announcement of working group meetings will be made.

Issued in Washington, DC, on August 21, 1997.

Joseph A. Hawkins,

Executive Director, Aviation Rulemaking Advisory Committee.

[FR Doc. 97-22922 Filed 8-27-97; 8:45 am]

BILLING CODE 4910-13-M

TASK 6: AGING AIRCRAFT PROGRAM (WIDESPREAD FATIGUE DAMAGE) (WFD)

[Federal Register: December 15, 1999 (Volume 64, Number 240)]
[Notices]
[Page 70104-70105]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]
[DOCID:fr15de99-112]

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

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

AGENCY: Federal Aviation Administration (FAA), DOT.

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

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

FOR FURTHER INFORMATION CONTACT: Kristin Larson, Transport Standards
Staff, ANM-110, FAA, Transport Airplane Directorate, Aircraft
Certification Service, 1601 Lind Ave. SW., Renton, WA 98055-4056, telephone (425) 227-1760, fax (425) 227-1100.

SUPPLEMENTARY INFORMATION:

Background

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

One area ARAC deals with is transport airplane and engine issues. These issues involve the airworthiness standards for transport category airplanes in 14 CFR parts 25, 33, and 35 and parallel provisions in 14 CFR parts 121 and 135. The corresponding European airworthiness standards for transport category airplanes are contained in Joint Aviation Requirements (JAR)-25, JAR-E and JAR-P, respectively. The corresponding Canadian Standards are contained in Chapters 525, 533, and 535, respectively.

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 6: Aging Aircraft Program (Widespread Fatigue Damage) (WFD)

The FAA requests that ARAC propose new operating rules (14 CFR parts 91, 121, 125, 129, and 135) that would ensure that no large transport category airplane (>75,000 lbs. Gross Take Off Weight) is operated beyond the flight cycle limits to be specified in the regulation, unless an ``Aging Aircraft Program'' has been incorporated into the operator's maintenance program.

[[Page 70105]]

The proposed rule and advisory material will establish:

1. The content of the Aging Aircraft Program (e.g., the necessary special inspections and modification actions for prevention of WFD), and

2. A limit of the ``validity'' (in terms of flight cycles or hours) of the Aging Aircraft Program where additional reviews are necessary for continued operation.

Additionally, ARAC is asked to review 14 CFR 25.1529 and 14 CFR part 25, Appendix H, and recommend changes to establish:

1. The required content of an Aging Aircraft Program.

2. The criteria by which to determine the validity of the Aging Aircraft Program (in terms of flight cycles or flight hours). This would effectively prohibit the operation of airplanes beyond the limited validity of the maintenance program. In order to operate beyond the declared limit, further evaluation of the design must be accomplished and the additional inspections and/or modifications added to the Aging Aircraft Program as necessary.

The FAA may ask ARAC to recommend disposition of any substantive comments the FAA receives in response to any of the notices of proposed rulemaking that result from ARAC's recommendations.

The FAA expects ARAC to forward its recommendations to the FAA within 9 months after tasking.

ARAC Acceptance of Task

ARAC has accepted this task and has chosen to assign it to the existing Airworthiness Assurance Working Group. The working group serves as staff to ARAC to assist ARAC in the analysis of the assigned task. Working group recommendations must be reviewed and approved by ARAC. If ARAC accepts the working groups recommendations, it forwards them to the FAA as ARAC recommendations.

Working Group Activity

The 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 ARAC to consider transport airplane and engine issue held following publication of this notice.

2. Give a detailed conceptual presentation of the proposed recommendations, prior to proceeding with its work.

3. Draft appropriate regulatory documents with supporting economic and other required analyses, and any other related guidance material or collateral documents to support its recommendations.

4. Provide a status report at each meeting of ARAC held to consider transport airplane and engine issues.

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

Meetings of ARAC will be open to the public, except as authorized by section 10(d) of the Federal Advisory Committee Act. Meetings of the Airworthiness Assurance Working Group will not be open to the public, except to the extent that individuals with an interest and expertise are selected to participate. No public announcement of working group meetings will be made.

Issued in Washington, DC, on December 9, 1999.
Anthony F. Fazio,
Executive Director, Aviation Rulemaking Advisory Committee.
[FR Doc. 99-32462 Filed 12-14-99; 8:45 am]
BILLING CODE 4910-13-M

APPENDIX B - AAWG TASK GROUP MAKE-UP

NAME	***Organization***	***E-Mail***
Bandley. B.	FAA-LAACO	BrentBandley@faa.gov
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APPENDIX C - MEETING VENUES

Meeting Schedule
AAWG - RWG Meetings

RWG Meeting No.	*Location*	*Dates Week of*
11	Gatwick UK	Aug 20, 2001
12	Long Beach CA	Jan 28, 2001
13	Gatwick UK	Apr 22, 2002
14	Savannah GA	Jun 24, 2002
15	Dresden GER	Sep 23, 2002
16	Seattle WA	Jan 20, 2002
17	Gatwick UK	April 2003

APPENDIX D – MEETING ATTENDANCE

MEETING ATTENDANCE
Regular Members

Name	***Representing***	**Meeting Number**															
		1	2	3	4	5	6	7	8	9	11	12	13	14	15	16	17
A. Santgerma	Airbus	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
R. Boetsch	Airbus	X	X	X	X	X	X	X	X	X	X	X	X		X		
R. Collins	Airbus	X	X	X	X	X	X	X	X	X			X				X
A. Hoggard	BCA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
B. Bandley	FAA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
B. Eastin	FAA										X	X		X	X	X	X
D. Marsh	BCA	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
J. Bristow	CAA-UK	X		X	X	X	X	X	X	X	X		X	X	X	X	X
A. Carter	Delta A/L	X	X	X	X	X	X		X	X	X	X	X	X		X	X
B. Schmidt	Airbus	X	X	X		X		X	X	X	X						
J. Peltz	FedEx				X	X	X	X	X	X	X	X	X	X		X	
D. Horne	FedEx				X	X	X	X	X	X	X	X	X	X		X	
M. Yerger	FedEx	X	X	X	X												
James Burd	Gulfstream					X	X	X	X	X	X	X	X	X	X	X	
Bert Hoogeland	KLM	X	X			X	X	X	X	X							
Ed Ingram	Lockheed-Martin	X	X		X	X	X										
Frank Perrin	DGAC-FR											X	X	X	X		
Donn Knight	UPS		X														

Also in Attendance at Meeting 14

Jeff Kollgaard, Boeing

Richard Minter represented John Bristow at the meeting.

APPENDIX E – ROUND ROBIN EXAMPLE PROBLEMS

A. MED Round Robin Number 1

Round-Robin

Problem For
MED

January 29, 2002

Output Data

1. ISP
2. SMP
3. Repeat interval
4. Applicable inspection process.
5. Applicant should describe how end point one differs from SSID approach.

Data Needed

Stress levels – Constant Amplitude, Open Hole -

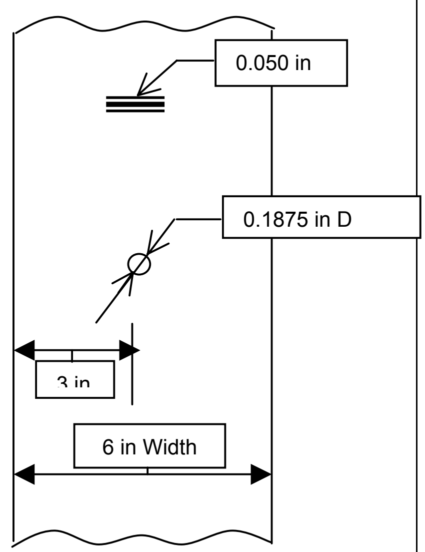
- So Max =100 MPA * 0.145 = 14.5 KSI frame stress
- R=0.0

7075-T6 Sheet, L-T Direction

- da/dn – See NASGROW
- fty, ftu – See B values in Mil Hndbk 5
- R curve/ Kc - See ESDU

Hole diameter = 0.1875 inches
Detectable Size = .12 inches
Frame Thickness = 0.05
Width of inner/outer cap = 1.25 inches
Frame depth – 4.5 inches
Frames per Airplane – 50 frames (100 locations)
Number of airplanes in fleet – 500

Characteristic Life – Beta – 120,000
Alpha - 6



OEM should use the above Weibul Distribution and assume it is to a 0.01 inch crack. Further OEM should estimate his own Weibul parameters and use them in a second analysis of this problem.

End Points

1. time for lead crack to reach 1" crack in frame
2. time to failure of lead crack at a_{crit} at limit load (first frame) – If there is a complete failure of a frame, the adjacent frames should assume an increase in load of 5% and they should be checked for residual strength at the higher load.

In reviewing the outcome of the first attempt on the round robin, it became quite clear that there were significant differences in the assumptions used by each of the participants. The AAWG quantify those differences to the extent they could but finally decided to redo the round-robin using the following assumptions:

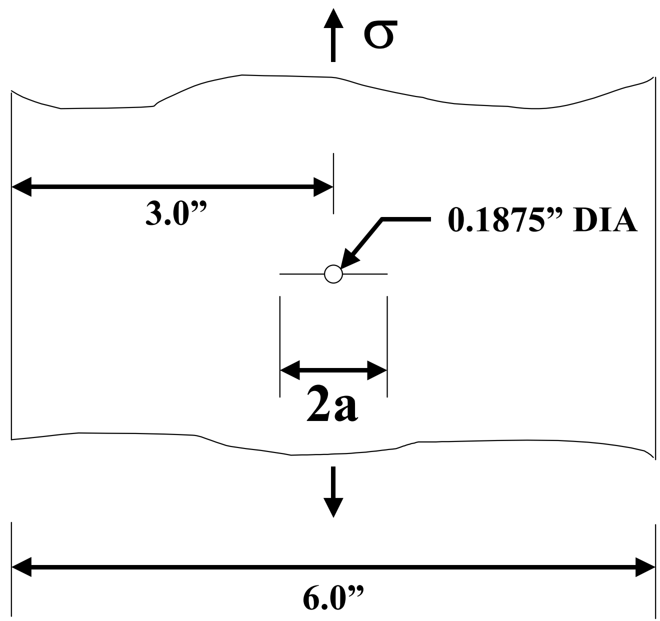
1. Assume cracks out of both sides of the hole
2. Assume fleet variability in ISP and SMP use alpha = 5 and in-house assumptions
3. Assume 1% of frames failed for average behavior
4. Assume the Beta=120,000 alpha =6 is to initiation of a 0.01 inch crack on both sides of hole
5. Assume 6 inch width
6. Assume average behavior does not include fleet variability
7. Detectable crack size is 0.12 inch cracks on both sides of hole.
8. State if ISP is to detectable, initiation or, neither
9. When does the adjacent frame crack
10. Problem ends at second frame failed
11. Supply the results in the tabular format.
12. To what degree can the methodology account for variations in fastener type and build standard for determination of when cracking starts?
13. When does load redistribution occur from the failing part to the remaining structure? When is it significant to cause interaction?

B. MED Round Robin Number 3

MED Round Robin #3

Given -

- **100 Airplanes in the fleet**
- **Inspections were performed on 14 airplanes, (each having accumulated a different number of flight cycles), at 78 detail locations on each airplane.**
- **Inspection findings are given on page 3 and 4.**
- **Each of the 78 locations is the same basic detail and is defined as follows:**



- **7075-T6 Sheet, t = .05”, LT**
- **da/dN per NASGROW**
- **F_{tu} and F_{ty} ‘B’ Basis per MIL-HDBK-5**
- **Once per flight cycle σ_{max} = 23.0 KSI, σ_{min} = 0 KSI**

Assumptions/Definitions –

- **All cracking is symmetric (i.e. equal size cracks at each side of hole).**
- **Initiation = .01” cracks at each side of hole.**
- **Detectable crack size is .12” cracks each side of hole.**
- **Failure condition(s) to be assumed**
  - **Single detail will cause residual strength to drop below required residual strength level.**
  - **Failure of any two details will cause residual strength to drop below required residual strength level.**
  - **Failure of any two adjacent details will cause residual strength to drop below required residual strength level. Only if you want too.**
- **Critical crack size for required residual strength condition is 2a = 1.0”**

Determine -

1. ISP
2. $WFD_{AVE\ BEHAVIOR}$
3. SMP
4. Number of details with 2a = 1.0” in a fleet of 100 airplanes at ISP.
5. Number of details with 2a = 1.0” in a fleet of 100 airplanes at SMP.

INSPECTIONS FINDINGS

NOTE: "1" indicates crack was $\geq$ the critical size of 2a = 1.0"

AC / FRAME	001	002	003	004	005	006	007	008	009	010	011	012	013	014
CYCLES	**22,896**	**32,824**	**32748**	**32,551**	**32897**	**30112**	**32,760**	**32,889**	**32,202**	**29,926**	**22,479**	**24,770**	**20,303**	**24,950**
01 RH							1							
01 LH														
02 RH											1			
02 LH														
03 RH				1										
03 LH				1				1						
04 RH														
04 LH					1			0.5						
05 RH		1												
05 LH														
06 RH					1		1							
06 LH			1											
07 RH			0.363	1										
07 LH														
08 RH		1	1		1	1		1	1			1		
08 LH					1									
09 RH			1	1		1		1	1		1	1		
09 LH														
10 RH		1	1		1	1	1		1	1		1		
10 LH														
11 RH		1	1			0.488								
11 LH														
12 RH						0.488								
12 LH														
13 RH			0.269				1							
13 LH														
14 RH		1					1							
14 LH														
15 RH														
15 LH			0.269											
16 RH							1			1				
16 LH					1									
17 RH				1			1		1					
17 LH		0.5		1		0.488	1	1						
18 LH			1	1	1		1							
18 RH				1	1			0.5	1					
19 LH		0.5		1			1	1						
19 RH				1	1				1					

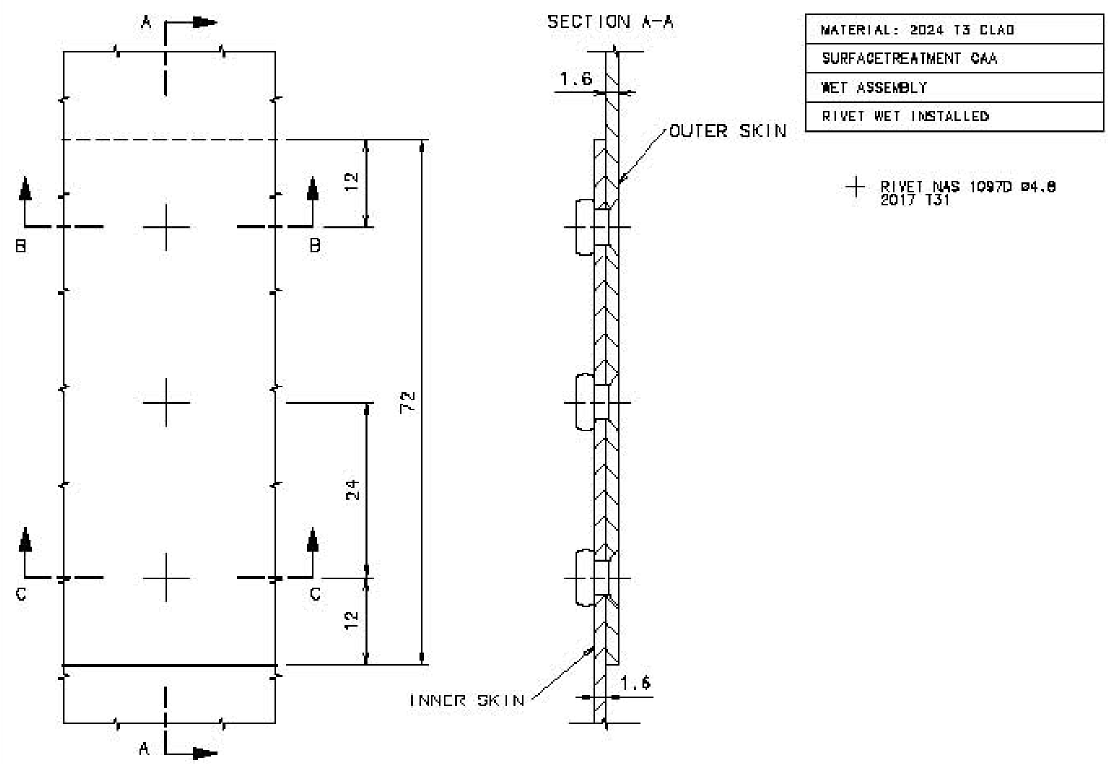
INSPECTION FINDINGS (continued)

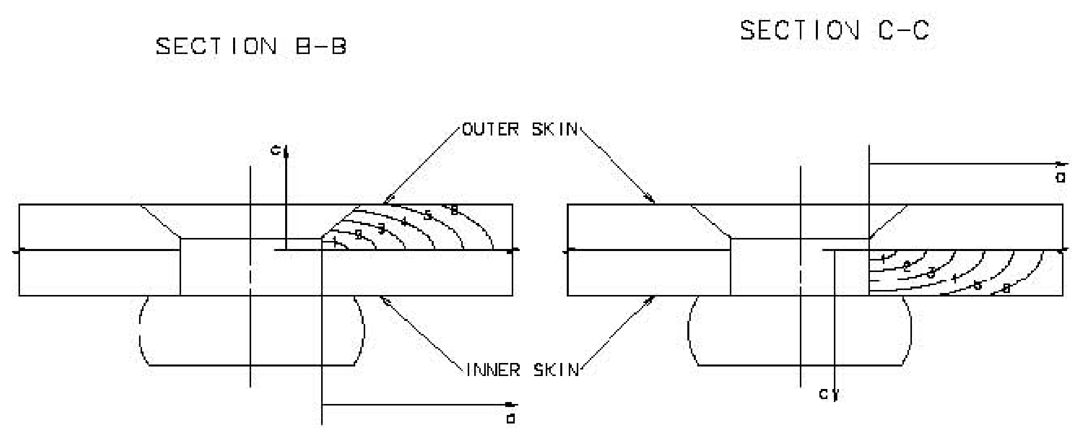
NOTE: "1" indicates crack was $\geq$ the critical size of 2a = 1.0"

AC / FRAME	001	002	003	004	005	006	007	008	009	010	011	012	013	014
CYCLES	**22,896**	**32,824**	**32,748**	**32,551**	**32,897**	**30,112**	**32,760**	**32,889**	**32,202**	**29,926**	**22,479**	**24,770**	**20,303**	**24,950**
20 LH			1	1			1			1				
20 RH									1					
21 LH			0.269		1		1		1					
21 RH				1	1		1	1	1	1				
22 RH					1			1						
22 LH								1						
23 RH							1							
23 LH														
24 RH				1										
24 LH														
25 RH														
25 LH					1									
26 LH			0.269				1							
26 RH														
27 LH			1	1	1	1		1	1					
27 RH														
28 RH														
28 LH					1			1						
29 LH			1		1			1						
29 RH														
30 RH														
30 LH			1		1				1					
31 RH														
31 LH								1						
32 RH														
32 LH			0.269		1			1						
33 RH		1	0.75											
33 LH														
34 RH									1					
34 LH			0.269	1	1	1								
35 RH								1		1				
35 LH					1	1		1			1			
36 RH			1		1	1		1	1	1				
36 LH			0.75	1				1						
37 RH		0.5	1	1					1					
37 LH		0.375	1	1		1				1				
38 RH														
38 LH			1	1										
39 RH														
39 LH			0.269											

C. NDI Round Robin

The following drawings document the NDI standard used for the NDI Round Robin.





	a mm	c mm
1	1.0	0.4
2	2.0	0.7
3	3.0	1.0
4	4.0	1.4
5	5.0	1.6
6	6.0	1.6

	a mm	c mm
1	1.0	0.4
2	2.0	0.7
3	3.0	1.0
4	4.0	1.4
5	5.0	1.6
6	6.0	1.6

A REPORT OF THE
AIRWORTHINESS ASSURANCE WORKING GROUP

WIDESPREAD FATIGUE DAMAGE
BRIDGING TASK
Mandatory Modifications

<u>FINAL REPORT</u>

July 2003

SIGNED BY

Kyatsandra Gopinath
Co-Chairperson, AAWG
Boeing Commercial Airplanes

Aubrey Carter
Co-Chairperson, AAWG
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REVISION PAGE

LTR	DATE	CHANGE	PAGES ADDED	PAGES DELETED	PAGES CHANGED	APPROVED BY

Table of Contents

Abbreviations and Definitions

AATF	Airworthiness Assurance Task Force
AAWG	Airworthiness Assurance Working Group
AC	Advisory Circular (FAR)
ACJ	Advisory Circular – Joint (JAR)
AD	Airworthiness Directive
ALI	Airworthiness Limitation Instructions
ARAC	Aviation Rulemaking Advisory Committee
ATA	Air Transport Association of America
CAA-UK	Civil Aviation Authority - United Kingdom
DGAC	Direction Générale de l'Aviation Civile - France
DSG	Design Service Goal
EAAWG	European Ageing Aircraft Working Group
ESG	Extended Service Goal
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
JAA	Joint Aviation Authorities
JAR	Joint Aviation Requirement
MED	Multiple Element Damage
MSD	Multiple Site Damage
NAA	Natonal Airworthiness Authority
NDI	Non Destructive Inspection
NPRM	Notice of Proposed Rulemaking
NTSB	National Transportation Safety Board
OEM	Original Equipment Manufacturer
PCA	Primary Certificating Authority
SB	Service Bulletin
SSIP	Supplemental Structural Inspection Program
STC	Supplemental Type Certificate
STG	Structures Task Group
TAEIG	Transport Airplane and Engines Issues Group
TC	Type Certification
TCH	Type Certificate Holder
WFD	Widespread Fatigue Damage

REFERENCES

[1] Anon., *"Continued Airworthiness of Ageing Aircraft Structures"* NPA 20-10, Section 4 re ACJ GAI20X11, Joint Aviation Authorities, Hoofddorp, The Netherlands (March 2003)

[2] Anon., *Continuing structural integrity program for large transport category airplanes*, FAA Advisory Circular No. 91-56A, Federal Aviation Administration, U.S. Department of Transport (April 1998)

[3] McGuire J*.," Structures Task Group Guidelines Document",* A report of the Airworthiness Assurance Working Group, Revision 1, (June 1996)

1.0 - Executive Summary

In July1999 the AAWG issued a report establishing a methodology to ensure that an airframe structure remains free from widespread fatigue damage. The report was in response to an ARAC tasking issued in 1997. The approach envisaged, and subsequently established as viable by an industry wide “Round Robin” comparative analysis, relied on a number of basic assumptions. One of which was the assumption that essential service bulletin modification actions had been embodied on the airframe. This report defines an acceptable procedure to establish which service bulletin modification actions are an essential element of the long term structural integrity of an airframe.

It is recommended that the advisory circular AC91-56 be updated along the lines of the technical text drafted by our European counterpart EAAWG to address the issue of service bulletin reviews and mandatory modification action. In particular the proposed text establishes:

(1) A standard way of assessing service bulletins for mandatory modification action
(2) The Structural Task Group way of working, clearly defined as a process
(3) Guidance on appropriate implementation times for ageing aircraft program actions.

2.0 - AVIATION RULEMAKING ADVISORY COMMITTEE TASKING

On August 28, 1997, the FAA formally notified the Aviation Rulemaking Advisory Committee; Transport Airplane and Engines Group through the Federal Register (Page 62 FR 45690 No. 167 08/28/97) of a new task assignment for action. The complete text of the Tasking Statement appears in Appendix A. Subsequently, the Transport Airplane and Engines Issues Group assigned action to the Airworthiness Assurance Working Group. The Task Assignment involves completion of the following tasks.

Task Title: Task 5: FAR/JAR 25, DEVELOP TECHNICAL POSITION RE: WIDESPREAD FATIGUE DAMAGE

Task Title: Task 6: FAR/JAR 25, TASK 6: AGING AIRCRAFT PROGRAM (WIDESPREAD FATIGUE DAMAGE) (WFD)

Task Title: Task 6A: FAR/JAR 25, WFD BRIDGING TASKS

The 1999 recommendations of the 1997 tasking [Task 5] were that new rules and advisory material were necessary for the preclusion of WFD in the commercial fleet. As a result, a second tasking was issued on December 15, 1999 **(70104 Federal Register / Vol. 64, No. 240 /)** (See Appendix A for complete tasking statement**)**, for the AAWG to write the required rules and advisory material. This Tasking was completed and the rules submitted for processing in December 2000. Accompanying the submission was an identification of 4 specific technical issues that required resolution before the recommended rules could be successfully implemented. These became known as the Bridging Tasks

A. MED Technical Considerations

B. Training

C. . NDI Round Robin

D. Mandatory Modifications

This Report addresses the fourth Bridging Task - Mandatory Modifications.

3.0 – BRIDGING TASK D – MANDATORY MODIFICATIONS

3.1 Introduction

Of the six initiates originally put forth by the AAWG, the only one that has not been officially documented is the Mandatory Modification Program. This program seeks to identify certain critical structural service bulletins for incorporation into the airplane to maintain continued airworthiness if certain criteria are met. That criteria has four elements:

1. There is a high probability that structural cracking exists
2. Potential structural airworthiness concern.
3. Damage is difficult to detect during regular maintenance
4. There is Adjacent Structural damage or the potential for it.

The European Airworthiness Assurance Working Group working in parallel with the AAWG has prepared guidance material for the mandatory modifications program [ref 1] which it offered to the AAWG for consideration. After discussions at 2 meetings each of the respective groups the technical text was agreed. Section 3.1 below sets out the technical text drafted by the EAAWG. The proposal is based on the format of AC91-56 [ref 2] introducing two new short sections covering the “way of working” and “implementation”, an expansion and revision to the existing section on the “Mandatory Modification Program” supported by a new appendix “Guidelines for the Development of a Service Bulletin Review and Mandatory Modification Programme”

3.2 Proposed Advisory Material for Service Bulletin Review / Mandatory Modifications Program

A number of additions to AC91-56 are proposed. Kindly note that in 3.2.1 thru 3.2.4 below the references made are to sections of AC91-56 and the spellings are European [demonstrating the international nature of the industry-wide cooperation of this activity]

3.2.1 Add New Section 5 - “WAY OF WORKING”

5. WAY OF WORKING

a. General
On initiative of the TCH and its PCA, a STG should be formed for each aircraft model for which it is decided to put in place an ageing aircraft programme. The STG shall consist of the TCH, selected operator members and a representative from the PCA. Other NAAs may be included as part of the STG at the option of the individual STG. The objective of

the STG is to complete all tasks covered in this AC in relation to their respective model types, including the following:

--Develop model specific programmes
--Define programme implementation
--Conduct recurrent programme reviews as necessary.

It is recognised that it might not always be possible to form or to maintain an STG, due to a potential lack of resources with the operators or TCH. In this case the above objective would remain with the appropriate PCA and operators or TCH as applicable, with a possible involvement of other NAAs.

An acceptable way of working for STGs is described in *"Structures Task Group Guidelines Document" [Ref3]* that was established by the AAWG with the following additional clarifications:

b. Meeting scheduling:
It is the responsibility of the TCH to schedule STG meetings. However if it is found by the appropriate PCA that the meeting scheduling is inadequate to meet the STG working objectives, they might initiate themselves additional STG meetings.

c. Reporting:
The STG would make recommendations for actions via the TCH to the PCA of the TCH. Additionally, the STG should give periodic reports (for information only) to AAWG/EAAWG as appropriate with the objective of maintaining a consistent approach.

d. Recommendations and decision making
The decision making process described in AAWG Report on Structures Task Group Guidelines paragraph 7 leads to recommendations for mandatory action from the TCH to its PCA. In addition it should be noted that the Airworthiness Authorities (the TCH's PCA and/or the NAA of the state of registry) are entitled to mandate safety measures related to ageing of aircraft structure, in addition to those recommended by the STG, if they find it necessary.

e. Responsibilities:
The PCA is responsible for issuing ADs or operational rules to mandate the STG's recommended ageing aircraft model specific programme. The NAAs of states of registry are responsible for ensuring the implementation of the ageing aircraft programme by their operators. The PCA and the TCH are responsible for monitoring the effectiveness of the ageing aircraft model specific programme, and to implement changes in the programme, as necessary.

3.2.2 Expand and Re-title Section 7

7. SERVICE BULLETIN REVIEW and MANDATORY MODIFICATION PROGRAMME

The Type Certificate Holder (TCH), in conjunction with operators, is expected to initiate a review of all structurally related inspection and modification SBs and determine which require further actions to ensure continued airworthiness, including mandatory modification action or enforcement of special repetitive inspections

Any aircraft primary structural components that would require frequent repeat inspection, or where the inspection is difficult to perform, taking into account the potential airworthiness concern, should be reviewed to preclude the human factors issues associated with repetitive inspections

The SB review is an iterative process (see appendix 5) consisting of the following items:

a. The TCH should review all issued structural inspection and modification SBs to select candidate bulletins, using the following 4 criteria:

1) There is a high probability that structural cracking exists
2) Potential structural airworthiness concern.
3) Damage is difficult to detect during routine maintenance
4) There is adjacent structural damage or the potential for it.

This may be done by the TCH alone or in conjunction with the operators as a preliminary STG meeting.

b. The TCH and operator members will be requested to submit information on individual fleet experience relating to candidate SBs. This information will be collected and evaluated by the TCH. The summarised results will then be reviewed in detail at a STG meeting (see c.).

c. The final selection of SBs for recommendation of the appropriate corrective action to assure structural continued airworthiness taking into account the in-service experience, will be made during an STG meeting by the voting members of the STG, either by consensus or majority vote, depending on the preference of the individual STGs.

d. An assessment will be made by the TCH as to whether or not any subsequent revisions to SBs affect the previous decision made. Any subsequent revisions to SBs previously chosen by the STG for mandatory inspection or incorporation of modification action that would affect the previous STG recommended action should be submitted to the STG for review.

e. The TCH should review all new structural SBs periodically to select further candidate bulletins. The TCH should schedule a meeting of the STG to address the candidates. Operator members and NAAs will be advised of the candidate selection and provided the opportunity to submit additional candidates.

3.2.3 Add New Section 12 - Implementation

12. <u>IMPLEMENTATION</u>.

Once the PCA has approved the document covering any of the issues covered in this ACJ, operators must amend their current structural maintenance programmes to comply with and account for the applicable actions. The programmes will either be mandated by ADs or by operational rules, which require operators to amend the current structural maintenance programmes. Any ADs issued as a result of a WFD finding that require structural modification will be handled separately. In all cases, compliance is required in accordance with the applicable regulations.

From the industry/authorities discussions leading to the definition of the programmes detailed in sections 6 to 10, above, appropriate implementation times have emerged. These programme implementation times are expressed as a fraction of the aircraft model's DSG/ESG.

Mandatory Modifications

CPCP	1/2 DSG/ESG
SSID	1/2 DSG/ESG
SB-Review	3/4 DSG/ESG
RAP	3/4 DSG/ESG
WFD	DSG/ESG

In the absence of other information prior to the implementation of these programmes the limit of validity of the existing maintenance programmes should be considered as the DSG/ESG. Typically, dependant on the date of the regulatory action mandating these programmes a period of one year to incorporate into an operators maintenance programme should be considered.

3.2.4 Add Appendix 5 - New

APPENDIX 5 GUIDELINES for THE DEVELOPMENT OF a SERVICE BULLETIN REVIEW and MANDATORY MODIFICATION PROGRAMME

1.Introduction

This appendix provides interpretation, guidelines and an acceptable means of compliance for the review of Structural Service Bulletins including a procedure for selection, assessment and related recommended corrective action for ageing aircraft structures.

2.1 SB selection process

The SB selection, review, assessment and recommendation process within the STG is summarised in figure **A**. For the first SB review within the STG meeting, all inspection SB should be selected. Afterwards, the TCH should maintain a list of SB which were already selected for a review with all decisions made, and add to this list all new and revised SB. Moreover, some specific modification SB not linked to an inspection SB may also be selected for review.

When an SB is selected, it is recommended to select also, in the same package, inspection SB that interact with it and all related modification SB.

The main criteria for selecting SB are the following **:**

(a) **High probability that structural cracking exists**

Notes:

- Related to the number and type of finding in service and from fatigue testing
- A “no finding” result should be associated to the number of performed inspections
- The type of finding should include an analysis of its criticality.

(b) Potential structural airworthiness concern

Notes:

- Structural airworthiness of the airplane is dependent on repeat inspections to verify structural condition and therefore on inspection reliability.
- A short repeat inspection interval (e.g. short time to grow from detectable crack to a critical length divided by a factor*)* will lead to increased work load for inspectors and possible increased risk of missing damage.
- Special attention should be paid to any single inspection tasks involving multiple repeat actions needed to verify the structural condition that may increase the risk of missing damage (e.g. lap splice inspections).

(c) Damage is difficult to detect during regular maintenance

Notes:

Considerations under this criterion are:

- The areas to inspect are difficult to access;
- NDI methods are unsuitable;
- Human factors associated with the inspection technique are so adverse that crack detection may not be sufficiently dependable to assure safety.

(d) There is adjacent structural damage or the potential for it

Notes:

- Particular attention should be paid to areas susceptible to Widespread Fatigue Damage (WFD) and also to potential interaction between corrosion and fatigue cracking e.g. between fastener damage (due to stress corrosion or other factors) and fatigue cracking.
- It is recommended to consider the potential interaction of modifications or repairs usually implemented in the concerned areas to check whether the inspections are still reliable or not (operators input)

Operators information input should address the points as detailed in figure B. This information should be collected and analysed by the TCH for the STG meeting.

If for a given selected SB there is not sufficient in-service data available before the STG meeting that would enable a recommendation to be made, its review may be deferred until enough data are available. The TCH should then check periodically until these data become available.

The operators and Airworthiness Authorities concerned should be advised by the TCH of the SB selection list and provided the opportunity to submit additional SB. For this purpose, the TCH should give the operators enough information in advance (e.g. 2 months), for them to be able to properly consider the proposed selection and to gather data.

2.2 STG meeting : SB review and recommendations

It is recommended to review at the same time all the SBs that can interact, the so-called SB package in the selection process. The meeting should start with an STG agreement on the selected SB list and on those deferred.

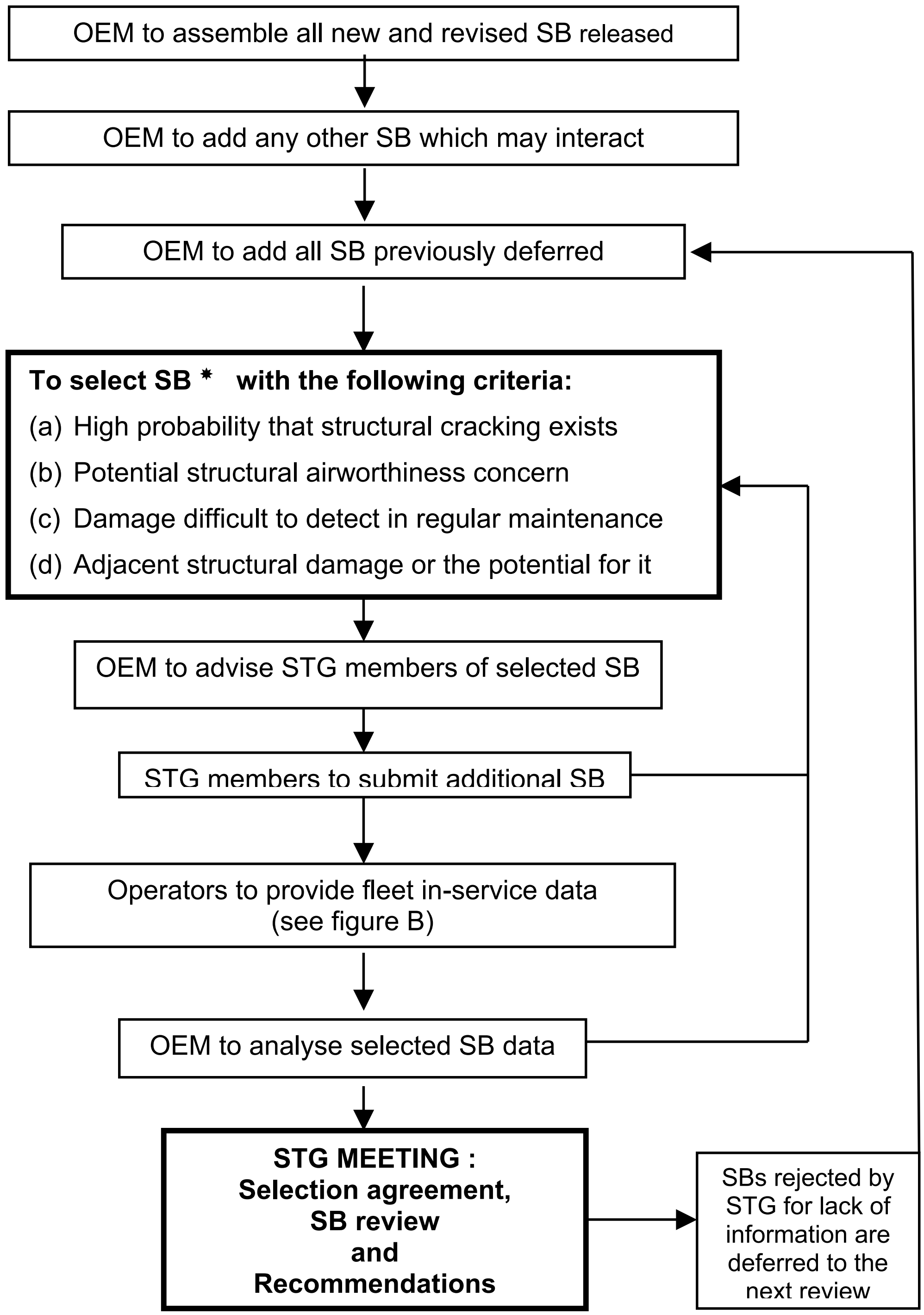
At the meeting the TCH should present its analysis of each SB utilising the collection of operator input data. The STG should then collectively review the ratings (Figure B Section 2) against each criteria to come to a consensus recommendation.

Such a STG recommendation for a selected SB shall consider the following options:

a. to mandate a structural modification at a given threshold
b. to mandate selected inspection SB
c. to revise modification or repair actions
d. to revise other SB in the same area concerned by damages
e. to review inspection method and related inspection intervals
f. to review ALI/MRB or other maintenance instructions
g. to defer the review to the next STG and request operators reports on findings for a specific SB or request an inspection sampling on the oldest aircraft

STG recommendations for mandatory action are the responsibility of the TCH to forward to his PCA for appropriate action. Other STG recommendations are information provided to the STG members. It is their own responsibility to carry them out within the appropriate framework.

Figure A SB SELECTION PROCESS AND SB REVIEW



* This may be done by the TCH alone or in conjunction with the operators as a preliminary STG meeting.

Figure B OPERATORS FLEET EXPERIENCE

IN-SERVICE DATA / SECTION 1

NAME OF THE OPERATOR
____

AIRCRAFT MODEL/SERIES
____

SERVICE BULLETIN (SB) NUMBER ________________
TITLE
____

RELATED INSPECTION/MODIFICATION SB :
1/____
2/____
3/____

SB MANDATED ? ☐ YES ☐ NO
IF NOT, SB IMPLEMENTED IN MAINTENANCE PROGRAMME ? ☐ YES ☐ NO

NUMBER OF AIRCRAFT TO WHICH SB APPLIES (INCLUDING ALL A/C IN THE SB EFFECTIVITY)____________________
NUMBER OF AIRCRAFT EXCEEDING SB INSPECTION THRESHOLD (IF APPLICABLE)
____

NUMBER OF AIRCRAFT INSPECTED PER SB (IF APPLICABLE) ?
____

SPECIFY TYPE OF INSPECTION USED
____

NUMBER OF AIRCRAFT WITH REPORTED FINDINGS
____

TYPE OF FINDINGS
____
____

NUMBER OF FINDINGS DUE TO OTHER INSPECTIONS THAN THE ONE PRESCRIBED IN SB (IF APLICABLE) ______________
SPECIFY TYPE OF INSPECTION USED
____

NUMBER OF AIRCRAFT EXCEEDING SB TERMINATING MODIFICATION THRESHOLD (IF APPLICABLE) _________________
NUMBER OF AIRCRAFT IN WHICH TERMINATING MODIFICATION HAS BEEN ACCOMPLISHED (IF APPLICABLE) ________

NEED THIS SB (OR RELATED SB) BE IMPROVED ? ☐ YES ☐ NO

COMMENTS:____
____
____
____

Figure B [continued]

IN-SERVICE DATA / SECTION 2

	(A)	(B)	(C)	(D)	(E)
CRITERIA	INSPECT-ABILITY ACCESS	FREQUENCY REPETITIVE INSPECTION	FREQUENCY OF DEFECTS	SEVERITY RATING	ADJACENT STRUCTURE DAMAGE
RATING					

(A) INSPECTABILITY/ACCESS RATING

OK	◆ Inspection carried out with little or no difficulty.
Acceptable	◆ Inspection carried out with some difficulty.
Difficulty	◆ Inspection carried out with significant difficulty.

Note: Rating should consider difficulty of access as well as inspection technique and size of inspection area.

(B) FREQUENCY OF REPETITIVE INSPECTIONS RATING

OK	◆ Greater than 6 years.
Acceptable	◆ Between 2 and 6 years.
Difficulty	◆ Less than 2 years.

(C) FREQUENCY OF DEFECTS NOTED RATING = % OF THOSE AEROPLANES BEYOND THRESHOLD ON WHICH DEFECTS HAVE BEEN FOUND

OK	◆ No defect noted.
Acceptable	◆ Defects noted but not of a significant amount (less than 10%).
Difficulty	◆ Substantial defects noted (greater than 10%).

(D) FINDING SEVERITY RATING

OK	◆ Airworthiness not affected.
Acceptable	◆ Damage not of immediate concern, but could progress or cause secondary damage.
Difficulty	◆ Airworthiness affected. Damage requires immediate repair.

(E) ADJACENT STRUCTURE DAMAGE RATING (MULTIPLE SITE DAMAGE, MULTIPLE ELEMENT DAMAGE, CORROSION, ETC.)

OK	◆ Low rate of adjacent structural damage.
Acceptable	◆ Medium rate of adjacent structural damage.
Difficulty	◆ High rate of adjacent structural damage/Multiple service actions in area.

4.0 - Recommendations

The AAWG recommends that the advisory circular AC91-56 be updated along the lines of the technical text given in section 3.1 drafted by our European counterpart EAAWG to address the issue of service bulletin reviews and mandatory modification action. In particular

1. A standard way of assessing service bulletins for mandatory modification action needs to be established
2. The Structural Task Group way of working has proved effective but needs to be defined and adopted
3. Guidance needs to be given on appropriate implementation times for ageing aircraft program actions.

5.0 – Conclusions

In July1999 the AAWG issued a report establishing a methodology to ensure that an airframe structure remains free from widespread fatigue damage. The approach envisaged, and subsequently established as viable by industry wide "Round Robin" comparative analysis, relied on a number of basic assumptions. One of which was the assumption that essential service bulletin modification actions had been embodied on the airframe before the WFD condition was approached.
This report has defined an acceptable procedure to establish those modification actions which are an essential element of the long term structural integrity of an airframe.

APPENDIX A – FAA/ARAC TASK 5 and 6 –AAWG

TASK 5 – DEVELOP TECHNICAL POSITION RE: WIDESPREAD FATIGUE DAMAGE

PAGE: 62 FR 45690 NO. 167 08/28/97

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Aviation Rulemaking Advisory Committee; Transport Airplane and Engine

Issues—New Task

AGENCY: Federal Aviation Administration (FAA), DOT.

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

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

FOR FURTHER INFORMATION CONTACT: Stewart R. Miller, Manager, Transport Standards Staff, ANM-110, FAA, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Ave. SW., Renton, WA 98055-4056, telephone (425) 227-2190, fax (425) 227-1320.

SUPPLEMENTARY INFORMATION:

Background

The FAA has established an Aviation Rulemaking Advisory Committee to provide advice and recommendations to the FA 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 of the FAA's commitment to harmonize its Federal Aviation Regulations (FAR) and practices with the aviation authorities in Europe and Canada.

One area ARAC deals with is Transport Airplane and Engine Issues. These issues involve the airworthiness standard for transport category airplanes in 14 CFR part 25, 33, and 35 and parallel provisions in 14 CFR parts 121 and 135. The corresponding European airworthiness standards for transport category airplanes are contained in Joint Aviation Requirements (JAR)-25, JAR-E and JAR-P, respectively. The corresponding Canadian Standards are contained in Chapters 525, 533 and 535 respectively.

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:

FAR/JAR 25 Aging Aircraft

1. ARAC is tasked to review the capability of analytical methods and their validation; related research work; relevant full-scale and component fatigue test data; and tear down inspection reports, including fractographic analysis, relative to the detection of widespread fatigue damage (WFD). Since aircraft in the fleet provide important data for determining where and when WFD is occurring in the structure, ARAC will review fractographic data from representative "fleet leader" airplanes. Where sufficient relevant data for certain airplane models does not currently exist, ARAC will recommend how to obtain sufficient data from representative airplanes to determine the extent of WFD in the fleet. The review should take into account the Airworthiness Assurance Harmonization Working Group report "Structural Fatigue Evaluation for Aging Aircraft" dated October 14, 1993, and extend its applicability to all transport category airplanes having a maximum gross weight greater than 75,000 pounds.
2. ARAC will produce time standards for the initiation and completion of model specific programs (relative to the airplane's design service goal) to predict, verify and rectify widespread fatigue damage. ARAC will also recommend action that the Authorities should take if a program, for certain model airplanes, is not initiated and completed prior to those time standards. Actions that ARAC will consider include regulations to require Type Certificate holders to develop WFD programs, modification actions, operational limits, and inspection requirements to assure structural integrity of the airplanes. ARAC will provide a discussion of the relative merits of each option.
3. This task should be completed within 18 months of tasking.

ARAC Acceptance of Task

ARAC has accepted this task and will assign it to a working group. The working group will serve as staff to ARAC to assist ARAC in the analysis of the assigned task. Working group recommendations must be reviewed and approved by ARAC. If ARAC accepts the working group's recommendations, it forwards them to the FAA and ARAC recommendations.

Working Group Activity

The working group is expected to comply with the procedure adopted by ARAC. As part of the procedures, the working group is expected to:

1. Recommend a plan for completion of the task, including rationale, for FAA/JAA approval within six months of publication of this notice.
2. Give a detailed conceptual presentation of the proposed recommendations, prior to proceeding with its work.
3. Provide a status report at each meeting of ARAC held to consider Transport Airplane and Engine Issues.

Participation in the Working Group

The working group will be composed of experts having an interest in the assigned task. A working group member need not be a representative of a member of the full committee.

An individual who has expertise in the subject matter and wishes to become a member of the working group should write to the person listed under the caption FOR FURTHER INFORMATION CONTACT expressing that desire, describing his or her interest in the task, and

stating the expertise he or she would bring to the working group. The request will be reviewed by the assistant chair, the assistant executive director, and the working group chair and the individual will be advised whether or not the request can be accommodated.

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

Meetings of ARAC will be open to the public, except as authorized by section 10(d) of the Federal Advisory Committee Act. Meetings of the working group will not be open to the public, except to the extent that individuals with an interest and expertise are selection to participate. No public announcement of working group meetings will be made.

Issued in Washington, DC, on August 21, 1997.

Joseph A. Hawkins,

Executive Director, Aviation Rulemaking Advisory Committee.

[FR Doc. 97-22922 Filed 8-27-97; 8:45 am]

BILLING CODE 4910-13-M

TASK 6: AGING AIRCRAFT PROGRAM (WIDESPREAD FATIGUE DAMAGE) (WFD)

[Federal Register: December 15, 1999 (Volume 64, Number 240)]
[Notices]
[Page 70104-70105]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]
[DOCID:fr15de99-112]

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

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

AGENCY: Federal Aviation Administration (FAA), DOT.

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

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

FOR FURTHER INFORMATION CONTACT: Kristin Larson, Transport Standards Staff, ANM-110, FAA, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Ave. SW., Renton, WA 98055-4056, telephone (425) 227-1760, fax (425) 227-1100.

SUPPLEMENTARY INFORMATION:

Background

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

One area ARAC deals with is transport airplane and engine issues. These issues involve the airworthiness standards for transport category airplanes in 14 CFR parts 25, 33, and 35 and parallel provisions in 14 CFR parts 121 and 135. The corresponding European airworthiness standards for transport category airplanes are contained in Joint Aviation Requirements (JAR)-25, JAR-E and JAR-P, respectively. The corresponding Canadian Standards are contained in Chapters 525, 533, and 535, respectively.

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 6: Aging Aircraft Program (Widespread Fatigue Damage) (WFD)

The FAA requests that ARAC propose new operating rules (14 CFR parts 91, 121, 125, 129, and 135) that would ensure that no large transport category airplane (>75,000 lbs. Gross Take Off Weight) is operated beyond the flight cycle limits to be specified in the regulation, unless an ``Aging Aircraft Program'' has been incorporated into the operator's maintenance program.

[[Page 70105]]

The proposed rule and advisory material will establish:
1. The content of the Aging Aircraft Program (e.g., the necessary special inspections and modification actions for prevention of WFD), and
2. A limit of the ``validity'' (in terms of flight cycles or hours) of the Aging Aircraft Program where additional reviews are necessary for continued operation.

Additionally, ARAC is asked to review 14 CFR 25.1529 and 14 CFR part 25, Appendix H, and recommend changes to establish:
1. The required content of an Aging Aircraft Program.
2. The criteria by which to determine the validity of the Aging Aircraft Program (in terms of flight cycles or flight hours). This would effectively prohibit the operation of airplanes beyond the limited validity of the maintenance program. In order to operate beyond the declared limit, further evaluation of the design must be accomplished and the additional inspections and/or modifications added to the Aging Aircraft Program as necessary.

The FAA may ask ARAC to recommend disposition of any substantive comments the FAA receives in response to any of the notices of proposed rulemaking that result from ARAC's recommendations.

The FAA expects ARAC to forward its recommendations to the FAA within 9 months after tasking.

ARAC Acceptance of Task

ARAC has accepted this task and has chosen to assign it to the existing Airworthiness Assurance Working Group. The working group serves as staff to ARAC to assist ARAC in the analysis of the assigned task. Working group recommendations must be reviewed and approved by ARAC. If ARAC accepts the working groups recommendations, it forwards them to the FAA as ARAC recommendations.

Working Group Activity

The 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 ARAC to consider transport airplane and engine issue held following publication of this notice.
2. Give a detailed conceptual presentation of the proposed recommendations, prior to proceeding with its work.
3. Draft appropriate regulatory documents with supporting economic and other required analyses, and any other related guidance material or collateral documents to support its recommendations.
4. Provide a status report at each meeting of ARAC held to consider transport airplane and engine issues.

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

Meetings of ARAC will be open to the public, except as authorized by section 10(d) of the Federal Advisory Committee Act. Meetings of the Airworthiness Assurance Working Group will not be open to the public, except to the extent that individuals with an interest and expertise are selected to participate. No public announcement of working group meetings will be made.

Issued in Washington, DC, on December 9, 1999.
Anthony F. Fazio,
Executive Director, Aviation Rulemaking Advisory Committee.
[FR Doc. 99-32462 Filed 12-14-99; 8:45 am]
BILLING CODE 4910-13-M

Appendix B - AAWG Task Group Make-up

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Appendix C - Meeting Venues

AAWG - RWG Meetings Schedule

RWG Meeting No.	*Location*	*Dates Week of*
11	Gatwick UK	Aug 20, 2001
12	Long Beach CA	Jan 28, 2001
13	Gatwick UK	Apr 22, 2002
14	Savannah GA	Jun 24, 2002
15	Dresden GER	Sep 23, 2002
16	Seattle WA	Jan 20, 2002
17	Gatwick UK	April 28, 2003

Appendix D – Meeting Attendance

Name	Representing	1	2	3	4	5	6	7	8	9	11	12	13	14	15	16	17
A. Santgerma	Airbus	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
R. Boetsch	Airbus	X	X	X	X	X	X	X	X	X	X	X	X		X		
R. Collins	Airbus	X	X	X	X	X	X	X	X	X			X				X
A. Hoggard	BCA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
B. Bandley	FAA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
B. Eastin	FAA										X	X		X	X	X	X
D. Marsh	BCA	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
J. Bristow	CAA-UK for JAA	X		X	X	X	X	X	X	X	X		X	X	X	X	X
A. Carter	Delta A/L	X	X	X	X	X	X		X	X	X	X	X	X		X	X
B. Schmidt	Airbus	X	X	X		X		X	X	X	X						
J. Peltz	FedEx				X	X	X	X	X	X	X	X	X	X		X	
D. Horne	FedEx				X	X	X	X	X	X	X	X	X	X			
M. Yerger	FedEx	X	X	X	X												
James Burd	Gulfstream					X	X	X	X	X	X	X	X	X	X		
Bert Hoogeland	KLM	X	X			X	X	X	X	X							
Ed Ingram	Lockheed-Martin	X	X		X	X	X										
Frank Perrin	DGAC-FR [JAA]											X	X	X	X		
Donn Knight	UPS		X														

Also at Meeting 14 – Jeff Kollgaard, Boeing and Richard Minter representing John Bristow.

Widespread Fatigue Damage

The WFD Story

The New Rules

&

The Technical Background

SUMMARY

- The FAA is requiring incorporation of a program to preclude widespread fatigue damage (WFD) into the FAA-approved maintenance program of each operator of large transport category airplanes.
- This action is the result of concern for the continued operational safety of airplanes that are approaching or have exceeded their design service goal (DSG).
- This proposed rulemaking would require a limit of validity (LOV) in flight cycles or hours of the structural maintenance program.
- To allow continued operation operators must incorporate added inspections and/or modification/ replacement actions into their maintenance program

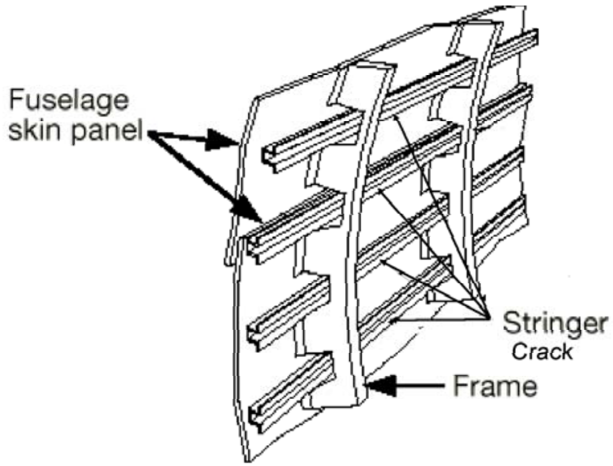
What is WFD?

- Widespread fatigue damage (WFD) is the simultaneous presence of cracks at multiple structural details.
- These cracks are of sufficient size and density that the structure will no longer meet its residual strength requirement and could catastrophically fail.
- Uniformly loaded structure may develop cracks in adjacent fasteners, or in adjacent similar structural details.
- These cracks may not be readily detectable and can interact to reduce the damage-tolerance capability of the structure.

The 2 Sources of WFD

- **<u>Multiple Site Damage (MSD)</u>.**

The simultaneous presence of fatigue cracks in the same element (fatigue cracks that may coalesce with or without other damage, leading to a loss of required residual strength)



- **<u>Multiple Element Damage (MED)</u>.**

The simultaneous presence of fatigue cracks in similar adjacent structural elements.

(e.g. Frames, Longerons, Stringers, etc.)

The Concern

- The likelihood of fatigue damage occurring in an airplane's structure increases with airplane use.
- The design process generally establishes a design service goal (DSG) in flight cycles or hours for the airframe.
- A period of time during which the principal structure will be reasonably free from significant cracking, including WFD.
- Typically any cracking that occurs on an airplane operated up to the DSG will occur in isolation
- Local cracking, originating from a single source, such as a random manufacturing flaw. Examples include a mis-drilled fastener hole or a localized design detail. It is unlikely that cracks from manufacturing flaws or localized design issues will interact strongly as they grow.
- With extended use, uniformly loaded structure may develop cracks in adjacent fastener holes, or in adjacent similar structural details.

The Concern -II

- The development of cracks at multiple locations also can result in strong interactions that can affect subsequent crack growth, in which case the predictions for local cracking would no longer apply.
- For example, this may occur at any skin joint where load transfer occurs. Simultaneous cracking at many fasteners along a common rivet line may reduce the residual strength of the joint below required levels before the cracks are detectable under the routine maintenance program established at time of certification.
- Furthermore such cracks, while they may or may not interact, can have an adverse effect on the structure's large damage capability (LDC) before the cracks become detectable.
- LDC is the ability of the structure to sustain accidental damage, fatigue damage, and environmental degradation, visually detectable under an operator's normal maintenance, and still maintain limit load capability with MSD to the extent expected at the point the structure is modified or replaced.

WFD Incidents In-Service

- In April 1988, a high-cycle transport airplane en route from Hilo to Honolulu, Hawaii suffered major structural damage to its pressurized fuselage during flight.
- The airplane managed to land after a structural failure caused an 18-foot section of the upper fuselage to separate from the airplane.
- The National Transportation Safety Board (NTSB) determined that, among other things, WFD was a contributing cause of this accident.
- Since the 1988 accident, there have been several other cases of WFD that have occurred in the fleet of large transport airplanes
- For example:

    In-flight failure of L-1011 aft pressure bulkhead stringer fittings

    Pressure bulkhead cracks found on the DC-9.

    Lap splice cracking found in the B727 and B737.

    Frame cracking found in the B747.

- Fortunately there has not been a major catastrophic accident directly attributable to WFD.

Structural Areas Most Susceptible to WFD

- The Airworthiness Assurance Working Group (AAWG), working under the tasking of the Aviation Rulemaking Advisory Committee (ARAC), with representatives of the FAA, and the JAA [the European Joint Aviation Authorities] reviewed available service difficulty reports for the transport airplane fleet.
- They also evaluated the certification and design practices applied to these previously certificated airplanes, including fatigue test results.
- The review revealed that all airplane models in the fleet are susceptible to some form of MSD or MED.
- This review was able to identify those airplane areas most susceptible to MSD or MED.

WFD Sites

At least 16 airframe structural features have been identified as possible sites for the development of WFD some examples are :-

Lap joints with milled, chemi-milled, or bonded radius	MSD
Skin at runout of large doubler [fuselage, wing, or empennage]	MSD
Skin splice at aft pressure bulkhead	MSD
Stringer-to-frame attachments	MED
Fuselage frames	MED
Overwing fuselage attachments	MED

Further details will be given in the technical background session

Regulatory Background -Design Requirements

25. 571

- Current FAR regulations, amended in 1998, are intended to require designs to preclude WFD from the fleet
- Special consideration for WFD where the design is such that this type of damage could occur.
- Also, it must be demonstrated with sufficient full-scale fatigue test evidence that WFD will not occur within the Design Service Goal [DSG] of the airplane.
- Only applied on the most recent type certification projects.
- Requirements before 1998 did not fully address WFD.
- Prior to 1978 FARs and before that CARs required evaluation of the structure by fatigue or fail-safe analysis, tests, or both.
- After 1978 evaluation was required, by a damage-tolerance assessment,
- Throughout, only of those parts of the structure whose failure could result in catastrophic failure needed.
- In general, type certificate holders (TCHs) have always conducted full-scale fatigue tests for large transport category airplanes, even though such tests were not required for certification in the USA until 1998.
- Similarly DSGs were not published in formal documentation

Provision of Maintenance Data

- Historically, the FAA has required TCHs to provide structural maintenance information
- Before 1970, most TCHs provided manuals containing maintenance information for large transport category airplanes,
- Then there were no standards prescribing minimum content, distribution, and timescale in which to provide the information to operators.
- In February 1970 §1529 was added to part 25 requiring the applicant for a type certificate to provide airplane maintenance manuals (AMM) to owners of the airplanes.
- The FAA amended §1529 in 1980 to require provision of Instructions for Continued Airworthiness (ICA) prepared under.
- ICA is required [Appendix H to part 25] to include a description of the airplane and its systems, servicing information, and maintenance instructions.
- The applicant must also include the frequency and extent of the structural inspections necessary to provide for the continued airworthiness of the airplane.
- In particular the ICA must have an approved Airworthiness Limitations section (ALS) listing those mandatory inspections, inspection intervals, replacement times, and related procedures approved under § 25.571, relating to structural damage-tolerance.

Provision of Maintenance Data -II

- The typical method of establishing initial scheduled maintenance and inspection tasks is the Maintenance Steering Group (MSG) process.
- The result of the latest MSG-3 process is an MRB [Maintenance Review Board] document that contains inspections of the airplane to address accidental damage, environmental damage, and fatigue damage.
- Earlier MSG processes were used that may not fully address this issue.
- Operators may incorporate those provisions, with other maintenance information contained in the ICA, into their maintenance program.
- FAR 21.50 requires the holder of a design approval [TC & STC Holders] to provide at least one set of the complete ICA to the owner of the product.
- A design approval holder who has changed the structure must provide a complete set of ICA for the change

Major Change in Type Design

- Over the years, many design changes have been introduced into structures that may affect their safety.
- There are three ways a person can obtain a design change approval:

    1. The type certificate holder (TCH) can apply for an amendment to the type design.

    2. Any person, including the TCH, wanting to alter a product by introducing a major change in the type design not great enough to require a new application for a TC, may apply for an STC.

    3. Sometimes a person also may make a major alteration or repair to the type design through a field approval. The field approval process is a streamlined method for obtaining approval of rather simple changes to airplanes [using FAA Form 337]

Regulatory Requirements -Maintenance and Inspection

- The FAA requires airplane operators to have extensive maintenance or inspection programs that include provisions relating to structure.
- FAR 121.367 requires air carrier and commercial operators in scheduled passenger service to have an inspection program, as well as a program covering other maintenance, preventive maintenance, and alterations
- FAR 129.14 requires a foreign air carrier and each foreign operator of a U.S.-registered airplane in common carriage, within or outside the U.S., to maintain the airplane under an FAA-approved program.
- In general, to develop the overall maintenance program for their airplanes, air carriers rely on—
    - the Type Certificate data sheet (TCDS)
    - MRB reports
    - the ICA
    - the ALS of the ICA;
    - manufacturers other recommendations
    - their own operating experience.

Current Aging Aircraft Programs

- Supplemental Structural Inspection Programs (SSIP)
- Corrosion Prevention and Control Programs (CPCP)
- Repair Assessment Program (RAP)
- Mandatory Modifications Program

Supplemental Structural Inspection Programs (SSIP).

- The FAA has issued airworthiness directives (AD) mandating SSIPs for many large transport category airplanes (e.g. Airbus Model A300; British Aerospace BAC 1-11; Boeing Models B-707/720, B-727, B-737, B-747; McDonnell Douglas Models DC-8, DC-9/MD-80, DC-10; Fokker Model F28; Lockheed Model L-1011 series airplanes)
- The TCHs for these airplanes developed the required Supplemental Structural Inspection Document (SSID) following AC 91-56.
- These mandated inspection programs are additional to each operator's maintenance program.
- The airplanes subject to the requirement for an SSIP were not certified to a damage-tolerance requirement. However, the structure to be evaluated, the type of damage considered (fatigue, corrosion, service, and production damage), and the inspection or modification criteria should, to the extent practicable, be in accordance with the damage-tolerance principles of the current § 25.571 standards.
- The FAA is considering rulemaking to require that maintenance programs of the following airplanes include an FAA-approved SSIP—
    - all airplanes operated under part 121;
    - all U.S. registered multi-engine airplanes operated in common carriage by foreign air carriers or foreign persons under part 129
    - all multi-engine airplanes used in scheduled operations under part 135.

Corrosion Prevention and Control Programs (CPCP)

- The CPCPs were mandated by AD for certain large transport category airplanes (Airbus Model A300; British Aerospace BAC 1-11; Boeing Models B-707/720, B-727, B-737, B-747; McDonnell Douglas Models DC-8, DC-9/MD-80, DC-10; Fokker Model F28; and Lockheed Model L-1011 series airplanes)
- The TCHs for these airplanes developed the CPCP document mandated by AD.
- These CPCPs supplemented each operator’s maintenance program.
- The TCHs developed the corrosion programs based on the premise that operators would adjust them when they found unacceptable corrosion levels.
- These maintenance program adjustments should preclude recurrence of unacceptable corrosion findings.
- Adjustments may include actions such as reduced repetitive task intervals, improved corrosion treatments, or multiple corrosion inhibitor applications.
- The FAA is considering rulemaking to require that maintenance programs of airplanes other airplanes include an FAA-approved CPCP- see later

Repair Assessment Program (RAP)

- The FAA issued a final rule entitled "Repair Assessment for Pressurized Fuselages," effective May 2000.
- It prohibits operation of certain large transport category airplanes operated under parts 91, 121, 125, and 129 beyond a specified compliance time, unless FAA-approved repair assessment guidelines are incorporated in their operation specifications or approved inspection program.
- The approved guidelines are applicable to the fuselage pressure boundary (fuselage skin, door skin, and bulkhead webs).
- The rule applies to large transport category airplane series, --
  A300; BAC 1-11; B-707/720, B-727, B-737, B-747;
  DC-8, DC-9/MD-80, and DC-10; F28; L-1011.
- The rule ensures that a comprehensive damage-tolerance repair assessment be completed for repairs to the fuselage pressure boundary.
- The FAA is considering rulemaking to require that repair assessment be made of structure other than the fuselage pressure boundary

Mandatory Modifications Program

- The mandatory modification program was based on the premise that, to ensure the structural integrity of older airplanes, there should be less reliance on repetitive inspections when certain criteria exist
  - A high probability that structural cracking exists
  - A potential airworthiness concern
  - Adjacent structural damage or the potential for it
  - Cracks that are difficult to detect during regular maintenance
    - the areas to inspect are difficult to access
    - non-destructive inspection (NDI) methods are unsuitable
    - human factors associated with the inspection technique are so adverse that crack detection may not be dependable enough to assure safety
- The FAA issued ADs that incorporated the structural modification program on the original 11 models (A300; BAC 1-11; B-707/720, B-727, B-737, B-747; McDonnell DC-8, DC-9/MD-80, DC-10; F28; and L-1011 series airplanes).
- Each of the TCHs, with their respective operators, reviewed their service bulletins with the FAA to determine which areas of structure needed modifications to terminate the inspections.
- The revised service bulletins with terminating modifications were mandated either grouped in a document or individually.

Limitations of Aging Aircraft Programs

- These four programs, or their equivalent, make up the current structural maintenance program that operators incorporate into their maintenance or inspection programs to address aging structural issues.
- Added maintenance actions are necessary, however, to address WFD issues, particularly for airplanes that have exceeded their DSGs.
- Specific maintenance instructions to detect and correct conditions that degrade the structural capabilities of the airplane because of WFD were not previously considered necessary.
- The FAA assumed the current structural maintenance and inspection programs would be enough to protect the structure and that the operators would retire the airplanes before reaching WFD.
- Also, the validity of the current structural maintenance program is not limited to a number of flight cycles or flight hours.
    - Certain structural components may be limited and must be replaced at a certain number of flight cycles or flight hours; but if operators carry out the maintenance or inspection program as outlined, they can operate the airplanes indefinitely.
- As demonstrated by the incidence of WFD described previously, these programs are not sufficient to preclude WFD.

Related Rulemaking Activity- Aging Airplane Safety.

- In response to the Aging Aircraft Safety Act of 1991 Act, the FAA published an interim final rule on December 6, 2002 (67 FR 72726).
- The rule ensures the continued airworthiness of aging airplanes operating in air transportation by applying damage-tolerance analysis and inspection techniques through mandatory records reviews and inspections after the airplane's 14th year in service and at specified intervals thereafter.
- Damage-tolerance-based supplemental inspections are applicable to the baseline structure (as built by the TCH) and all major RAMs.
- The damage-tolerance-based supplemental inspections are required by December 2007 for
  - all airplanes operated under part 121;
  - all U.S.- registered multi-engine airplanes operated under part 129; and
  - all multi-engine airplanes used in scheduled operations under part 135.
- The FAA is allowing certain exceptions for airplanes with mandated AC 91-60 service-based supplemental inspection programs, or for airplanes that have reached the design-life goal as listed in the rule.

Related Rulemaking Activity
Corrosion Prevention and Control Program

- In its accident investigation report on the 1988 accident in Hawaii, the NTSB recommended that the FAA mandate a comprehensive and systematic CPCP
- The FAA found that in some cases operators do not have a systematic approach to corrosion control.
- The FAA is considering rulemaking and published an NPRM "Corrosion Prevention and Control Program," in October 2002
- The proposed rule would require that maintenance programs include an FAA-approved CPCP within a specified amount of time for --
  - all airplanes operated under part 121;
  - all U.S.- registered multi-engine airplanes operated under part 129; and
  - all multi-engine airplanes used in scheduled operations under part 135.

The Need for Additional Rulemaking

- Regulatory and industry experts agree that as the transport airplane fleet continues to age, eventually WFD is inevitable.
- Because existing maintenance programs are inadequate to prevent WFD, long-term reliance on these programs, even those that incorporate the latest mandatory changes introduced to combat aging, creates an unacceptable risk of age-related accidents.
- WFD can and does occur in the fleet
- The FAA has therefore determined that, at a certain point of an airplane's life, the existing aging airplane program is not sufficient to ensure the continued airworthiness of that fleet of airplanes.
- The FAA also has been addressing immediate safety issues relevant to WFD and other aging phenomena on a case-by-case basis by issuing **Airworthiness Directives (AD** s) requiring corrective action.
- Such ADs are not a proactive means to deal with aging airplanes overall. theydo not address potential WFD problems that may exist on other parts of the airplane

Aviation Rulemaking Advisory Committee Recommendations

- The FAA tasked in November 1992 to provide advice and recommendations on various aging aircraft issues. As part of its response to this task, ARAC presented seven recommendations to the FAA concerning the need for a structural audit of transport category airplanes to determine the state of WFD in the transport fleet.
- The basic recommendation was to revise AC 91-56 to include guidance for a proposed structural audit for WFD.
- The report recommended that the STG's perform the audit voluntarily, under the direction of the manufacturers.
- Any safety-related issues would be brought to the attention of the FAA for corrective action.
- The AAWG developed a new appendix to AC 91-56 covering guidance on the development of a WFD prediction and verification technique to preclude operation of large transport airplanes in the presence of WFD.
- The FAA accepted it and in April 1998, issued AC 91-56A, That AC contains Appendix 2 "Guidelines for the Development of a Program to Predict and Eliminate Widespread Fatigue Damage,"

Further ARAC tasking on WFD

- In August 1997 FAA tasked ARAC again to determine the extent of WFD in the fleet.
- ARAC assigned this task to the AAWG.
- AAWG was to review analytical methods, relevant fatigue test data, related research work and teardown inspection reports; to develop time standards for implementation of a WFD program and to recommend actions FAA might take to address this issue.
- The tasking further required that a team of technical experts review the technical program that the AAWG developed with the purpose of confirming the approach adopted by the AAWG and ensuring compliance with the tasking.
- The Authorities' Review Team consisted of experts from the United Kingdom Civil Aviation Authority (CAA-UK) and French Direction Générale de l'Aviation Civile (DGAC) representing JAA, and the FAA.
- The 4 person Authorities' Review Team having conducted reviews in 1998 and 1999 fully supported the approach proposed by AAWG following resolution of three issues
- The AAWG completed the tasking and produced recommendations in a final WFD Report
- The FAA tasked the Technical Oversight Group for Aging Aircraft (TOGAA) to review and comment on the WFD Report. TOGAA approved this AAWG methodology in January 2000.

Summary of WFD Report Recommendations

- Clarify the terminology in AC 91-56A.
- Develop rules and advisory material that will provide specific programs, including a structural audit, to preclude WFD in the fleet.
- Implement an effective aging airplane program, including a Mandatory Modifications Program, CPCP, RAP, and an SSIP or ALS as a necessary prerequisite for an effective program to address MSD or MED.
- Use a monitoring period to manage potential MSD or MED scenarios in the fleet, if the structural audit determines that MSD or MED cracking is detectable before the structure loses its required residual strength.
- Carefully consider any program established to correct MSD or MED in the fleet to ensure the necessary lead times are addressed to develop resources to implement fleet action. For example, operators need time to assess their fleet and perform a structural audit of repaired, altered, or modified structure that is susceptible to MSD or MED.

Tasking to Recommend Changes Needed to Operating Rules

- !n December 1999 following an FAA tasking of ARAC, AAWG were tasked to develop rules and advisory material that will preclude WFD in the fleet.
- The new rules and AC are based on the recommendations ARAC presented to the FAA in response to this tasking.

Rationale behind the New Rule

- The FAA's review of the service history, design features, and maintenance instructions of the transport fleet shows that aging of structure susceptible to MSD and MED, which could eventually lead to WFD, has become a safety issue for the fleet of large transport category airplanes.
- The FAA proposal amends the current regulations in two areas to add a new operational rule in parts 121 and 129 intended to prevent WFD.
    1. The first requirement concerns the need to limit the validity of the current structural maintenance program.
    2. The second requirement concerns the need to impose operational requirements that mandate a structural maintenance program to prevent WFD in the fleet on baseline, repaired, altered, and modified structure.
- The operator, together with the TCH, is expected to begin development of a maintenance program with the intent of precluding WFD.
- Such a program must be implemented before WFD may develop in the fleet as supported by analysis, tests, or service experience.

Rationale behind the New Rule

- In general, because of the small likelihood of MSD or MED occurring in airplane operation up to its DSG or ESG, maintenance programs developed for initial certification have generally considered only local fatigue cracking.
- As the airplane reaches its DSG or ESG, it is necessary to take appropriate action in the aging fleets to preclude WFD so that continued safe operation of the airplane is not jeopardized.
- The TCH or the operator should conduct structural evaluations to determine where and when MSD/MED may occur.
- Based on these evaluations, the TCH, and occasionally the operators, would provide additional maintenance instructions for the structure as appropriate. The maintenance instructions include, but are not limited to--

    inspections;

    modification or replacement of structure; and

    limits of validity of the new maintenance instructions.
- Mostly, a combination of inspections and/or modification/replacement actions is considered necessary to achieve the required safety level. Other cases will require modification or replacement if inspections are not viable.

Applicability of Operational Requirements

- The proposed operational requirements would apply only to large transport airplanes greater than 75,000 pounds (maximum takeoff gross weight).
- The FAA recognizes that this does not align with the "One Level of Safety" initiative (that is, the same safety level for large airplanes as well as commuter or small airplanes). However :-
  - Historically, the Aging Aircraft Program has focused on airplanes greater than 75,000 pounds (maximum takeoff gross weight) because most passenger-carrying airplanes were of that size.
  - AC 91-56 delineated that certain airplanes over 75,000 pounds develop an SSIP which was mandated by AD.
  - Eventually, CPCPs were mandated by AD for these airplanes as well.
  - Several of the current initiatives to bring commuter airplanes in line with aging aircraft programs have already been accomplished on the large transport airplanes.
  - The Aging Commuter Aircraft Program is not yet as mature as the Large Transport Aging Aircraft Program. Many commuter airplane TCHs are just developing CPCPs and damage-tolerance-based SSIPs for the first time.
  - The FAA has funded development of damage-tolerance-based SSIPs to help foster this development process for the smaller airplanes. The Airplane Safety Act is Rulemaking related to this activity

Proposed Operating Requirements

- Rule has four key paragraph
  - Paragraph (a) covers Limits of Validity
  - Paragraph (b) covers Baseline Structure
  - Paragraph (c) covers Existing Repairs
  - Paragraph (d) covers New Repairs
- Applies to transport category airplanes, greater than 75,000 pounds (maximum takeoff gross weight),
- FAA approval throughout is by the FAA Aircraft Certification Office (ACO) or office of the Transport Aircraft Directorate (TAD) having cognizance over the type certificate.

Paragraph (a) *Limits of Validity*

- This paragraph prohibits the operation of transport category airplanes greater than 75,000 pounds (maximum takeoff gross weight) after a specified deadline unless an FAA-approved LOV in flight cycles or flight hours is specified in the ALS.
- Currently, only airplanes certified to FAR25 at or after Amendment 25-54 have an ALS incorporated into their ICA. For those models of airplanes, the operator must revise the ALS to include the LOV.
- For airplanes certified to FAR25 before Amendment 25-54, or to the requirements of Civil Air Regulations (CAR) 4b, the operator would need to develop a new ALS with a specified LOV.
- Regardless of the certification basis, the LOV chosen must ensure that WFD is precluded from the fleet until that airplane has reached the limit.
- At the LOV the operator must either stop operating the airplane or may continue to operate with a redefined LOV based on a maintenance program designed to preclude the occurrence of WFD in the fleet.
- The FAA expects that, typically, the LOV will be chosen at the airplane's DSG.

Paragraph (a) *Limits of Validity*

- The TCH usually established the DSG during design or certification as a period of time (in flight cycles or hours) during which the principal structure will be reasonably free from significant cracking. Some of the TCHs performed fatigue tests on their airplane models to twice the life described in the DSG. Some have done additional fatigue testing, teardown inspections, in-service evaluations, and analysis to justify establishment of an Extended Service Goal [ESG].
- When the DSG or ESG were originally created, the industry believed that operators would retire airplanes before reaching these goals. Sometimes, however, airplanes have continued in operation well beyond the DSG. It is therefore imperative to limit the validity of the current structural maintenance program until the maintenance program is revised to address inspections and/or modification/replacement of structure to prevent WFD in the fleet.
- In the course of of the AAWG activities, the TCHs have agreed to develop or revise, for each affected airplane model, the ALS to establish an LOV to the current structural maintenance program
- These new or revised ALS documents may not be received in time from the TCH to support issuance of this NPRM.

Paragraph (a) *Limits of Validity*

- In the NPRM for the new rule the FAA proposed a table of LOVs for various airplane types
- These were established in various ways:-
    - the TCH has revised or created a new ALS with the LOV;
    - the TCH sent the FAA a letter stating what the LOV should be; or
    - the FAA established the LOV based on a conservative estimate in the absence of TCH information
- The FAA will consider supporting data from any other entities (for example, operators) wishing to establish the LOV for a particular model based on their knowledge of the model and its susceptibility to WFD.
- Once the FAA is satisfied the LOV chosen are appropriate, the ALS will receive a “conditional” approval The ALS will require final approval after the final rule is issued.

Provisional LOVs

Airplane Model	Limit of Validity
CHECK with FAA if OK	

Paragraph (b) *Baseline structure*

- The new rule would prohibit operation of transport category airplanes greater than 75,000 pounds MTOW beyond the LOV specified in its ALS, or a specified date, unless a WFD structural maintenance program is incorporated in its maintenance program.
- This WFD program must include inspections and/or modification/replacement actions to the baseline structure to prevent WFD, and a schedule for completing the specified actions.
- The new WFD program will be limited by a revised LOV specified in the ALS.
- This WFD program, revised LOV and ALS require FAA approval
- For the baseline structure, most of the major TCHs agreed to publish the inspection procedures and modification/replacement actions as necessary to preclude WFD in the fleet for those airplanes that have exceeded their DSG or ESG prior to the adoption of the final rule.
- The procedures will require final approval after the final rule is issued. The operator could choose to incorporate that program to meet the proposed requirement.
- If the TCH chooses not to develop a program to preclude WFD, then the FAA would require the operator to develop a program independently to operate up to a revised LOV.

Paragraph (c) *Existing Repairs*

- This part of the new rule rule also prohibits operation of certain transport category airplanes greater than 75,000 pounds (maximum takeoff gross weight) after a specified date, unless a supplemental WFD program (SWFD) is incorporated within its maintenance program for structure with existing RAMs,.
- This SWFD program must include inspections and/or modification/replacement actions for RAMs susceptible to MSD or MED.
- It must also include RAMs that affect baseline structure susceptible to MSD or MED that are accomplished prior to the effective date of the final rule.
- This SWFD program must also include the schedule for completing the specified actions.
- "Baseline structure" is considered "affected" if it has been physically altered or repaired, or if the loads acting on the baseline structure have been increased or redistributed.

Paragraph (c) *SWFD program*

- Rule specifies that certain tasks must be accomplished within 48-month time frame:
- Within 6 months, operators must develop a plan to address RAMs
- The plan must consist of
  - » a list of MSD or MED susceptible RAMs or those that affect MSD or MED susceptible baseline structure
  - » the analytical method the operator plans to use to perform a WFD assessment
  - » a schedule for developing the SWFD.
- The SWFD must be accomplished within 36 months after initial incorporation per proposed paragraph (b), or within 36 months beyond the time the airplane has accumulated the LOV specified in its ALS, whichever occurs later.
- Within 48 months after initial incorporation per paragraph (b) or within 48 months beyond the time the airplane has accumulated the LOV specified in its ALS, whichever occurs later, each operator must incorporate an FAA-approved SWFD into its maintenance program.

Paragraph (d) *New repairs*

- Covers new requirements for RAMs installed after the effective date of the rule that are susceptible to MSD or MED. It also includes RAMs that affect baseline structure that is susceptible to MSD or MED.
- The rule prohibits operation of certain transport category airplanes18 months after accomplishment of such a RAM, unless an appropriate threshold for inspection and/or modification/replacement action is incorporated within its maintenance program.
- This threshold establishes when the operator must accomplish inspections and/or modification/replacement actions to such a RAM to preclude WFD. The threshold must be approved by the FAA.
- Operators must accomplish the following at the times noted:
  - Within 18 months of the approval for return to service, a WFD analysis of the repair, alteration, or modification, which defines the threshold for inspections and/or modification/replacement actions, must be approved by the FAA ACO or office of the TAD.
  - Prior to reaching 75% of the threshold, establish the inspection methods, repeat intervals and/or modification replacement actions for the RAMs
  - By the threshold, inspection methods, repeat intervals and/or modification/replacement actions for the repair, alteration, or modification are to be FAA-approved.

Potential Regulatory Action

SFAR

- The ability of operators to comply is heavily dependent on the affected TCHs fulfilling their voluntary commitment to develop baseline programs in a timely manner.
- FAA anticipates that most of these programs will be available
- In the past there have been significant delays in the completion of similar programs.
- If TCHs appear unable to fulfill their commitments the FAA may issue a SFAR
- A SFAR requiring TCHs to develop WFD programs would be similar to SFAR 88, which requires TCH development of programs to improve fuel tank safety.

Additional Directive

- During the structural evaluation for WFD it is possible that an unsafe condition may be identified
- Immediate inspections and/or modification/replacement of structure action, as needed. would be mandated by the FAA issuing an AD.
- AD will not be used for incorporating LOVs in the ALS of the ICA- Approval letters will be issued

Design Requirements

- Harmonization work was completed in 2003 to incorporate the LOV concept into 25.571 for new designs

Records

- The WFD rule imposes new FAA record keeping requirements.
- Record-keeping requirements would be added to the current operating regulations (e.g 121.380)
- As a consequence of the Aging Airplane Safety rule, records are required to be retained permanently.
- Such required records include evidence of FAA approvals of damage tolerance assessments and WFD assessments performed to comply with the proposed Aging Airplane Safety rule and this rule.
- When incorporating a structural WFD Program into its approved maintenance program, operators should address the how it will comply with these new record-keeping requirements.
- That means of compliance, with the rest of the program, would be subject to approval by the cognizant PMI or other airworthiness inspector.

Position in Europe [JAA]

- The WFD Rule is an FAA operational rule
- Design rules today are harmonized between USA [FAA] and Europe {JAA].
- This is not the case for operational rules
- Such operational rules do not apply to aircraft registered and operated in other countries – This includes the WFD Rule.
- However through the international participation in AAWG and liaison with the parallel JAA group, EAAWG, regulatory action is taking place to cover WFD in the European fleet
- JAA Joint Aviation Authorities of European countries – although not a single legal entity acts as a unified body on regulation – 2003-2007 evolving into a single regulatory body - EASA
- EAAWG is the European Ageing Aircraft Working Group
- Two areas of regulation development in final stages of approval in 2003
  - NPA OPS28
  - NPA 20-10

Position in Europe [JAA]

- NPA OPS28
  - Introduce a requirement on Air Transport operators under JAR OPS 1 to incorporate ageing aircraft structural programmes, within one year of publication, into their maintenance data
  - Limit of validity of maintenance data to be stated

- NPA 20-10
  - Introduces comprehensive guidance material on all aspects of ageing aircraft structures ACJ 20X11
  - Supports both design and operational rules
  - Adopts and adapts all the AAWG activity into the JAA regulatory framework
  - WFD approach follows AAWG recommendations directly

Economic Issues

Assumptions

- 600 airplanes involved over 20yr period
- Accident 1 in 1.06M landings of airplanes beyond original LOV
- Accident cost $315M
- Potential for 6.4 accidents in period
- A WFD inspection cost between $26K and$132K per airplane

- Costs are airplane inspection, modification and retirement; plus FAA costs
- Benefits from both accidents and unscheduled inspection downtime avoided

- Complicated risk analysis leads to
  - Total Costs $360M
  - Total Benefit $725M

- Sensitivity study [half & twice uncertain parameters] showed benefit always remains greater than cost

Note: Figures are rounded data taken from FAA NPRM preamble

WFD Evaluation

- To operate an airplane beyond the established LOV, an evaluation of each area susceptible to WFD must be completed.
- This evaluation would establish the necessary elements to determine a maintenance program to preclude WFD in that particular airplane fleet.
- The elements determined for each susceptible area typically include:
  - WFD Average Behavior
  - Initial Crack/Damage Scenario.
  - Final Cracking Scenario.
  - Crack Growth Calculation.
  - Potential for Discrete Source Damage (DSD).
  - The analytical methods used to determine the WFD Average Behavior.
  - Inspection Start Point (ISP).
  - Structural Modification Point (SMP).
  - Inspection Interval and Method.
- *A fuller description is given in the Technical Background Session*

Structural RAMs

- Operators are responsible for ensuring that all major modifications (including STCs and field approvals), repairs, and alterations that affect structure identified by the TCH as susceptible to MSD or MED are evaluated.
- The evaluation should be to the same standard as the baseline structure.
- The operator will need to conduct a survey on each of its airplanes to determine what RAMs would be susceptible to MSD or MED.
- The following are a few selected examples of RAMS with such concerns:
  - Passenger-to-freighter conversions (including addition of main deck cargo doors).
  - Complete re-engine or pylon modifications.
  - A modification that results in operational mission change that significantly changes the manufacturer's load or stress spectrum.

A more complete list with examples is given in the Technical Background session

Maintenance Data Evaluation

- For all areas identified as susceptible to MSD or MED, the current structural maintenance program should be reviewed to determine if it includes satisfactory structural maintenance and inspection provisions to safeguard the structure against unanticipated cracking or other structural degradation.
- The following actions should be performed during the review:
  - From the WFD evaluation establish an SMP for each area.
  - Compare the calculated SMP to the current structural maintenance program.
- For susceptible areas approaching the SMP[or for areas that cannot be reliably inspected]
  - develop and document a program that provides for replacement or modification of the susceptible structural area.
- For each area where it the SMP is not imminent [and that can be reliably inspected], :-
  - – Determine the inspection requirements (method, start point, and repeat interval) for each susceptible area (including structure expected to arrest cracks) necessary to maintain safety.
  - – Review the elements of the existing maintenance programs already in place.
  - – Revise and highlight elements of the maintenance program necessary to maintain safety.

Period of Evaluation Validity

- The initial evaluation of the complete airframe should cover a significant forward estimation of the projected airplane use beyond its DSG, also known as the "Proposed ESG." Typically, an assessment through at least an additional 25% of the DSG would provide a realistic forecast with reasonable planning time for necessary maintenance action.
- On completion and FAA approval of the evaluation and publication of the revised maintenance requirements, the proposed ESG becomes the ESG. Later evaluations should follow similar validity period guidelines as the initial evaluation.

Immediacy of Problem

- It is now over 15years since the Hawaii accident
- In addition there are 4 those significant incidents mentioned earlier
- Furthermore in its 1999 report AAWG cited instances of MSD or MED events in eleven different types of large transport airplanes
- This evidence points to the need to enhance existing aging programs with the new WFD rule

List of Acronyms

AAWG	Airworthiness Assurance Working Group
AC	Advisory Circular
ACO	Aircraft Certification Office
AD	Airworthiness Directive
ALS	Airworthiness Limitations Section
AMM	Airplane Maintenance Manuals
ARAC	Aviation Rulemaking Advisory Committee
CAR	Civil Air Regulations
CFR	Code of Federal Regulations
CPC	Corrosion Prevention and Control Program
DER	Designated Engineering Representative
DSD	Discrete source damage
DSG	Design service goal
ESG	Extended service goal
FAA	Federal Aviation Administration
ICA	Instructions for Continued Airworthiness
ISP	Inspection start point
JAA	Joint Aviation Authorities
LDC	Large Damage Capability
LOV	Limit of Validity

More Acronyms

MED	Multiple element damage
MRB	Maintenance Review Board
MSD	Multiple site damage
MSG	Maintenance Steering Group
NDI	Nondestructive inspection
NPRM	Notice of Proposed Rulemaking
NTSB	National Transportation Safety Board
PMI	Principal Maintenance Inspector
PSE	Principal structural element
RAP	Repairs Assessment Program
SSID	Supplemental Structural Inspection Document
SMP	Structural modification point
SSIP	Supplemental Structural Inspection Program
STC	Supplemental Type Certificate
STG	Structural Task Group
TAD	Transport Airplane Directorate
TC	Type certificate
TCH	Type certificate holder
TOGAA	Technical Oversight Group: Aging Aircraft
WFD	Widespread Fatigue Damage

Epilogue to Regulatory Session

- A bibliography and the text of the WFD Rule will be provided in hard copy
- This session has only briefly touched on the technical issues
- These are covered in more detail and greater depth in the Technical Background Section

Widespread Fatigue Damage

The WFD Story

The New Rules

&

The Technical Background

WFD Technical Considerations

- This session provides an overview of the technical requirements associated with the Operational Rule for WFD and the supporting advisory material AC91-56
- Topics covered are
  - The Concept of LOV
  - The Evaluation Process
    - Identify primary structure susceptible to MSD/MED.
    - Predict when it is likely to occur
    - Establish additional maintenance actions, as necessary, to ensure continued safe operation of the airplane.
  - Maintenance Program Aspects

The Concept of Limit of Validity

Limit of Validity (LOV)

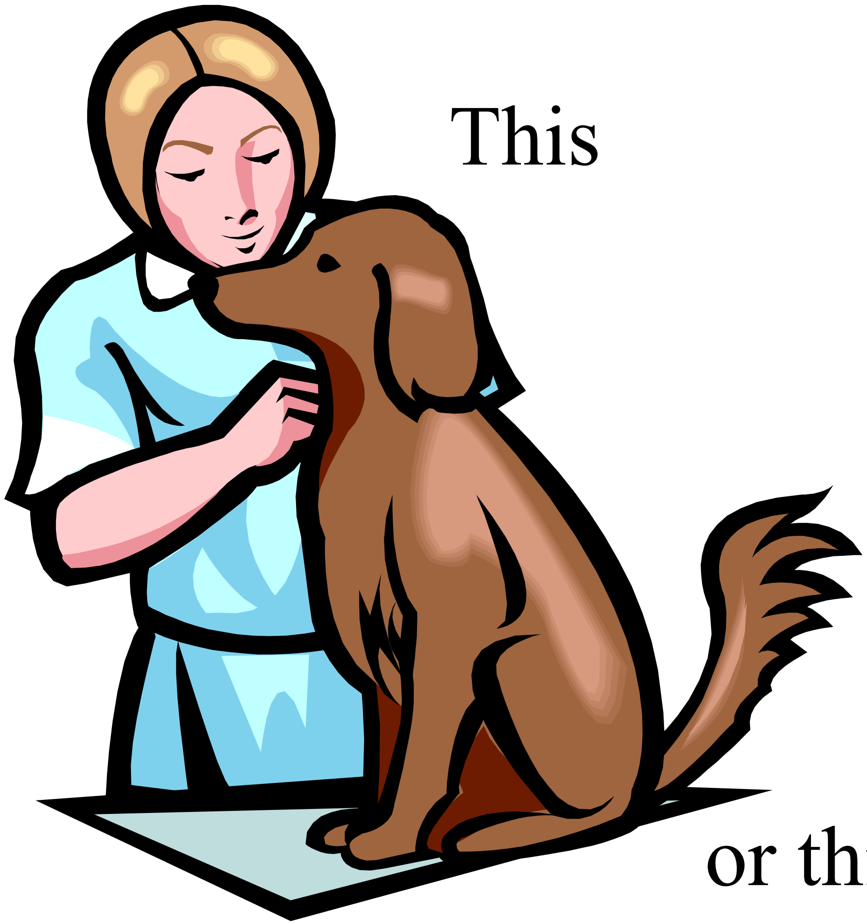
- The WFD rule prohibits operation beyond an established LOV.
- LOV is the period of time in flight cycles or hours, where additional inspections and/or modification/replacement actions must be incorporated into the operator's maintenance program in order to continue operation.
- LOV designates the extent to which the maintenance data has been duly substantiated by testing, design, and in-service data for the prevention of WFD in the fleet.
- LOV should be based on a combination of analytical and fatigue test evidence equivalent to a confidence level of a two lifetime fatigue test.
- Beyond LOV there is significantly increased risk of uncertainties in structural performance and the probable development of WFD.

Limit of Validity (LOV)

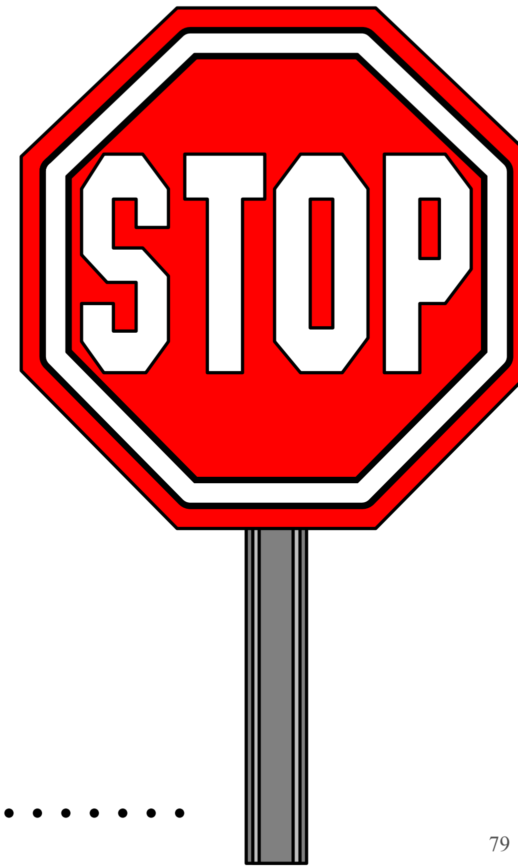
- LOV represents an operational limit based on the engineering data that supports the maintenance program. Therefore, all identified service actions are required for operation up to LOV.
- Prior to the completion of the structural evaluation for WFD, an initial estimate of LOV could be set at DSG.
- Any LOV extension requires additional fatigue test evidence and validation of the maintenance program for efficacy against WFD and other fatigue damage.
- When a structural evaluation for WFD for baseline structure has been performed and a corresponding modified maintenance program developed then a revised LOV may be established.
- A revised LOV is only applicable after an operator incorporates the modified maintenance program for baseline structure with the revised LOV into his maintenance program.

What is LOV?

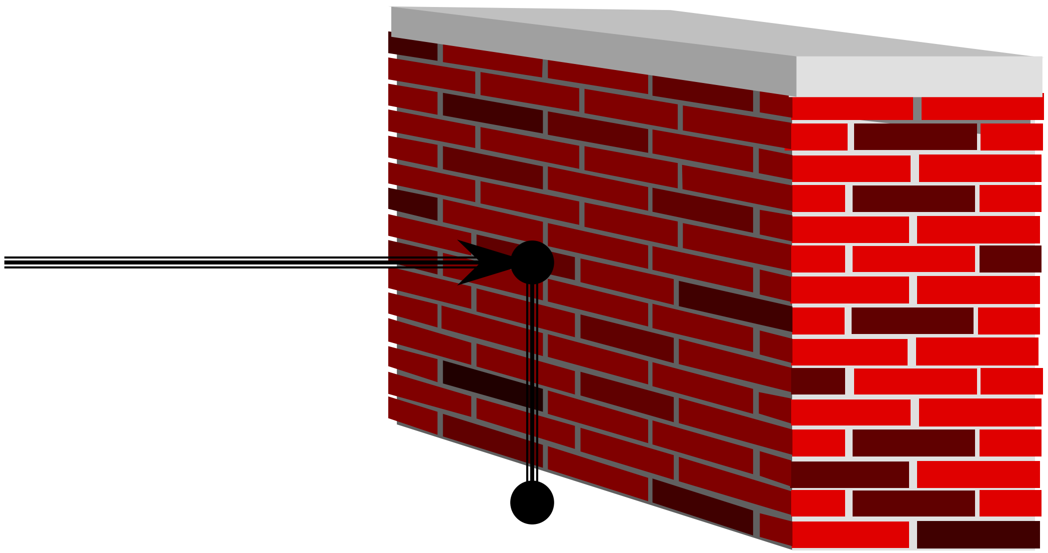
This



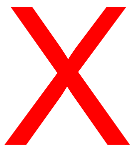
or this............



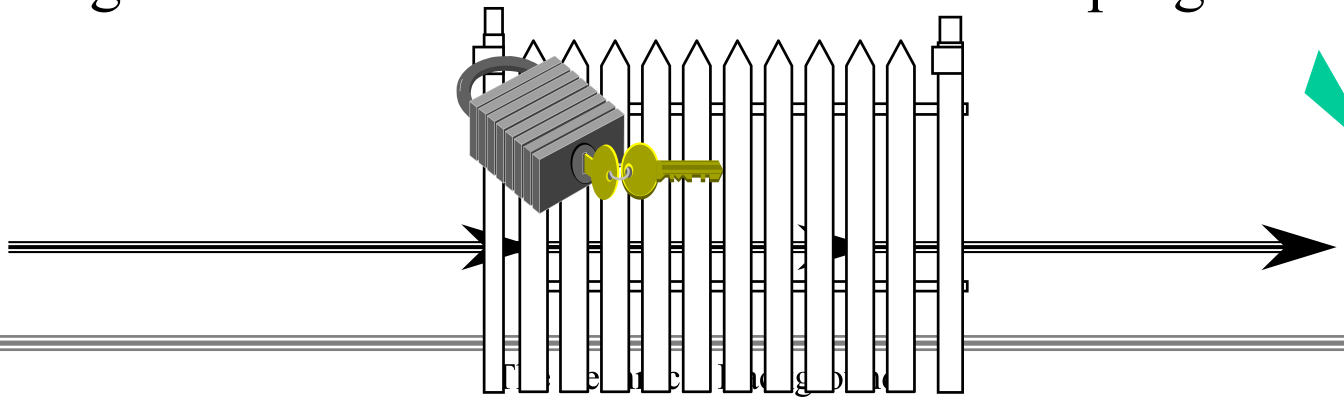
LOV



Is not a brick wall



It is a gate that can be unlocked with a WFD program



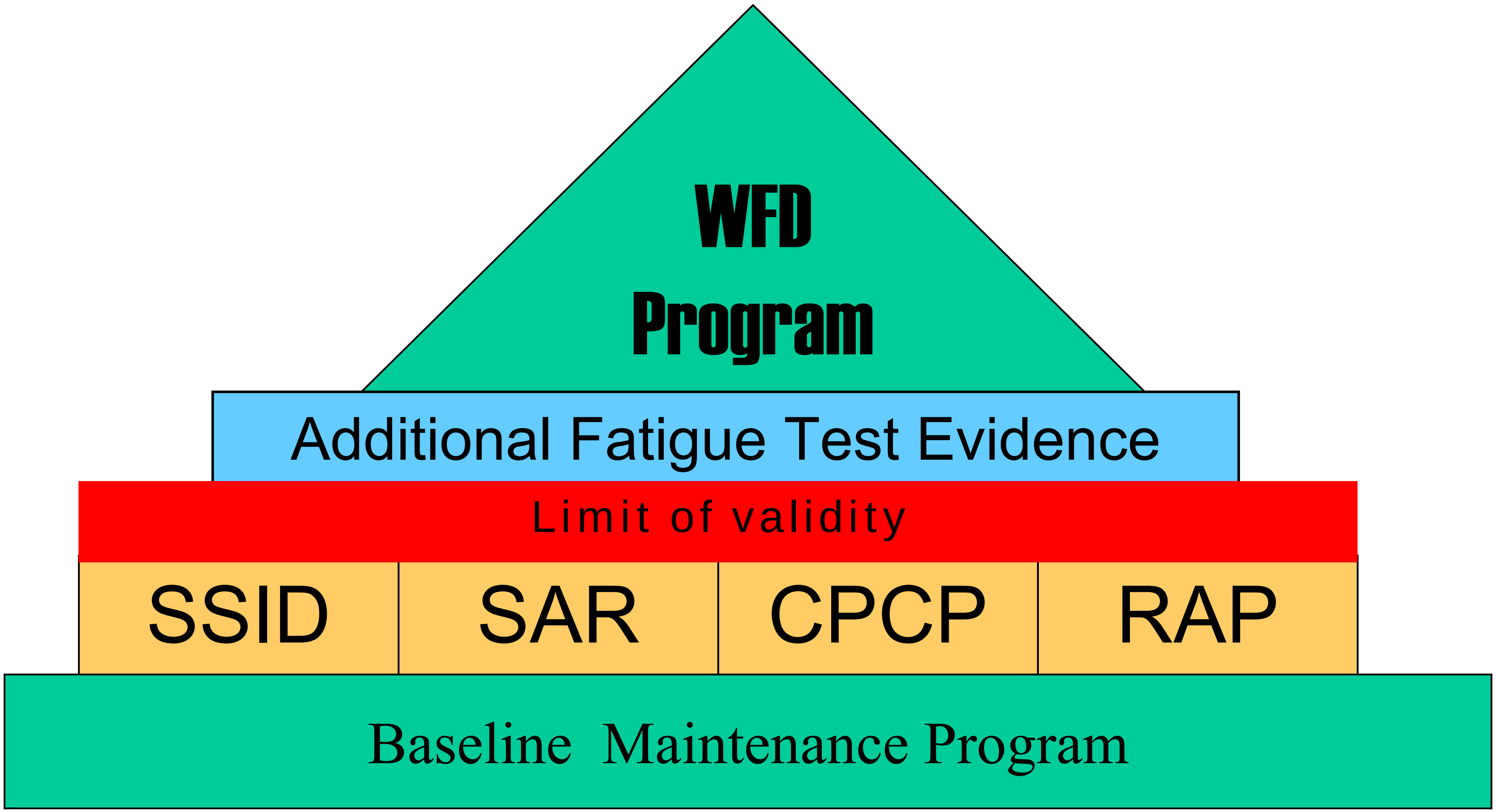
LOV is… “ a Journey”

- Within the LOV there may well be several stops [or none] on the way
- These stops are maintenance actions at ISP and SMP
- They are not related to the LOV
- LOV is the end of the substantiating data road
- If you take a second trip you find a new LOV
- Either way SMP and ISP are what you found on the road

LOV Caveats

- Within the LOV it is understood that :_
  - For all models, an active aging airplane program exists, consisting of:
    - Mandatory Modifications
    - Corrosion Prevention and Control
    - Repair Assessment
    - Supplemental Structural Inspections
- All currently known structural airworthiness issues, including WFD, have been recognized and service actions have been initiated under existing continuing airworthiness processes

What You need for Operation Beyond Limit Of Validity



Fatigue Test Evidence

- Several references are made to Fatigue Test Evidence
- It consists of data collected from the following sources:
  - Full scale Fatigue Test with or without tear down
  - Full scale component tests with or without tear down
  - Tear down of a high time airplane
  - Tests of structural features
  - Fleet proven life techniques
  - Evaluation of in-service problems experienced by other airplanes with similar design concepts
  - Analysis methods which have been parametrically developed to reflect fatigue test and service experience.

WFD Program

Contents in common

- Susceptible structure with WFD concern
  - Picture, description, area number, station location and airplanes affected
- Inspection Start Point (ISP)
- Inspection methods and intervals
- Structural Modification Point (SMP)
- Description of modification required at SMP
- Other references (Aging Airplane programs, SB's, AD's)

To establish this data a WFD Evaluation [or Audit] has to undertaken……….

The WFD Evaluation Process

Has three objectives

- Identify primary structure susceptible to MSD/MED
- Predict when it is likely to occur
- Establish additional maintenance actions, as necessary, to ensure continued safe operation of the airplane

WFD Evaluation

The analysis and program for WFD is different from that performed for the SSID program :-

SSID	**WFD Analysis**
Damage is localized	Damage is widespread
Typically "single" initial lead crack	"Many" initial small cracks
Little or no interaction	Complex interaction
Crack growth problem	Initiation and crack growth problem
Typically single large critical crack	Many small "interacting" critical cracks
Several Inspection Options	Limited Inspection Options
Open ended – safety by inspection	LOV established – safety by retirement
Relatively long repeat inspections	Relatively short repeat inspections
Deterministic approach	Probabilistic assessment required
Analysis relatively easy	Analysis is complex with many scenarios

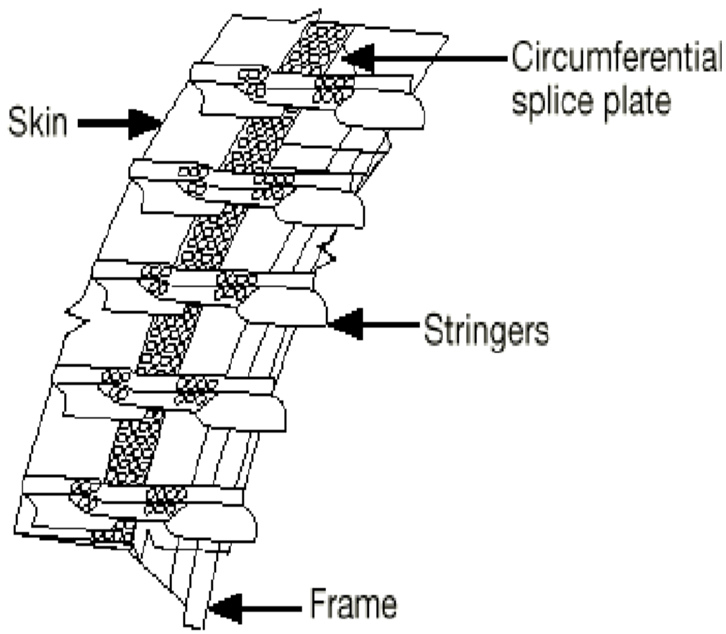
WFD Susceptible Areas

- Each area susceptible to the development of MSD/MED cracking have similar characteristics
  - Similar repetitive details
  - Similar Stresses
- However each WFD susceptible area will have it's own analysis to derive an inspection start point ISP and structural modification point SMP
- The AAWG, in it's 1999 report, identified sixteen generic structural arrangements that have developed WFD cracking in the past, either on test or in service…………

WFD Susceptible Areas

Longitudinal skin joints, frames, and tear straps	MSD/MED
Circumferential joints and stringers	MSD/MED
Fuselage frames	MED
Lap joints with milled, chemi-milled, or bonded radius	MSD
Stringer-to-frame attachments	MED
Shear clip end fasteners on shear tied fuselage frames	MSD/MED
Aft pressure dome outer ring and dome web splices	MSD/MED
Skin splice at aft pressure bulkhead	MSD
Abrupt changes in web or skin thickness - pressurized or unpressurized	MSD/MED
Window surround structure	MSD/MED
Overwing fuselage attachments	MED
Latches and hinges of non-plug doors	MSD/MED
Skin at runout of large doubler fuselage, wing, or empennage	MSD
Rib to skin attachments	MSD/MED
Typical wing or empennage structure	MSD/MED
Wing and empennage chordwise splices	MSD/MED

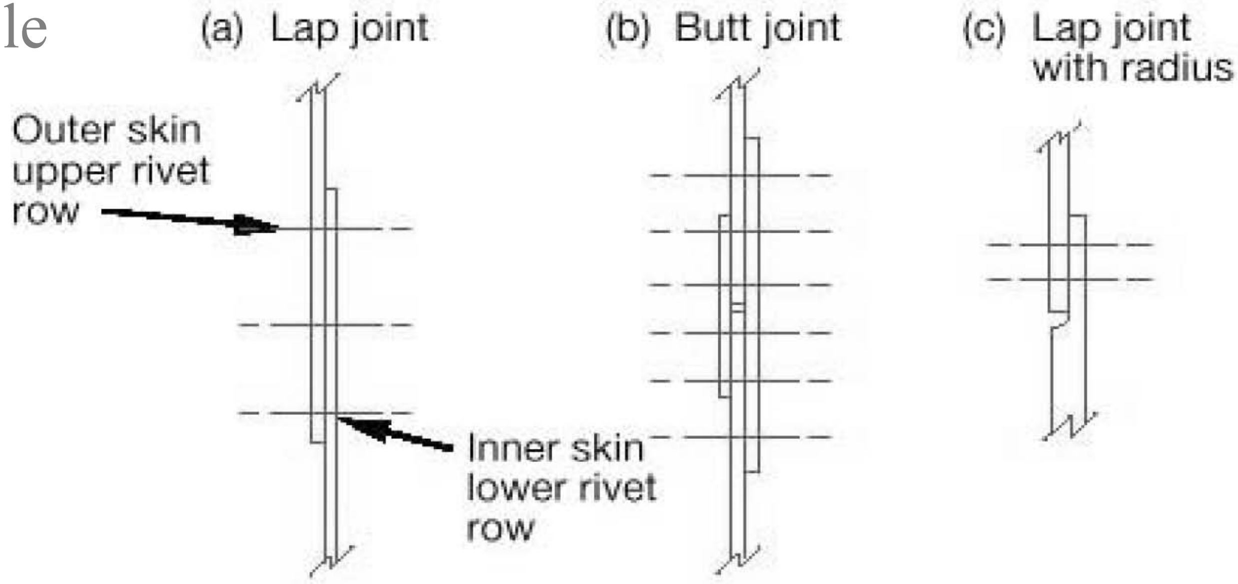
Circumferential Joint and Stringer WFD Example



Types and possible location of MSD/MED

- MSD - circumferential joint
  - Splice plate - between and/or at inner rivet rows
  - Skin-forward/aft rivet row of splice plate
- MED
  - Stringer - first fastener of stringer coupling
  - Stringer couplings in splice plate area

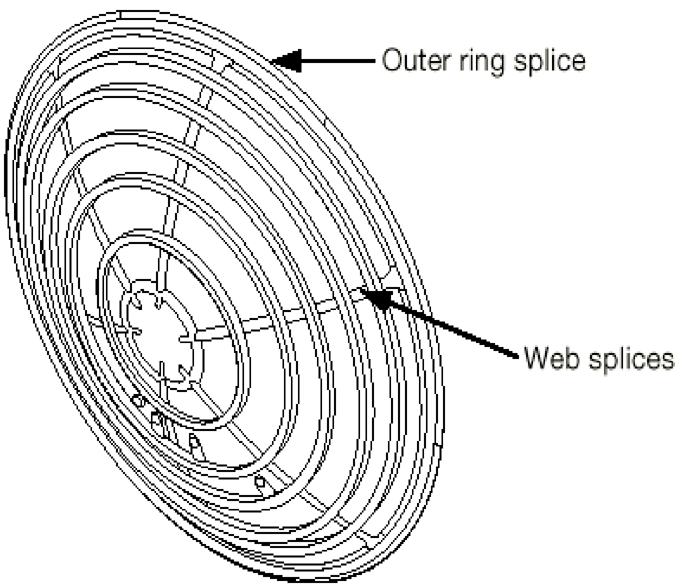
MSD Example Lap Splices

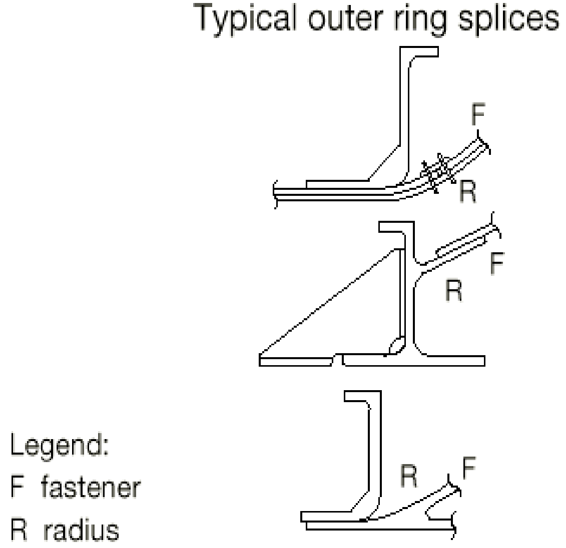


Service or test experience of factors that influence MSD and MED (examples)

- High stress—misuse of data from coupon test
- Corrosion
- Disbond
- Manufacturing defect
  - Surface preparation
  - Bond laminate too thin
  - Countersink, fastener fit
- Design defect—surface preparation process

MED Example
Pressure Dome Outer Ring and Dome Web Splices





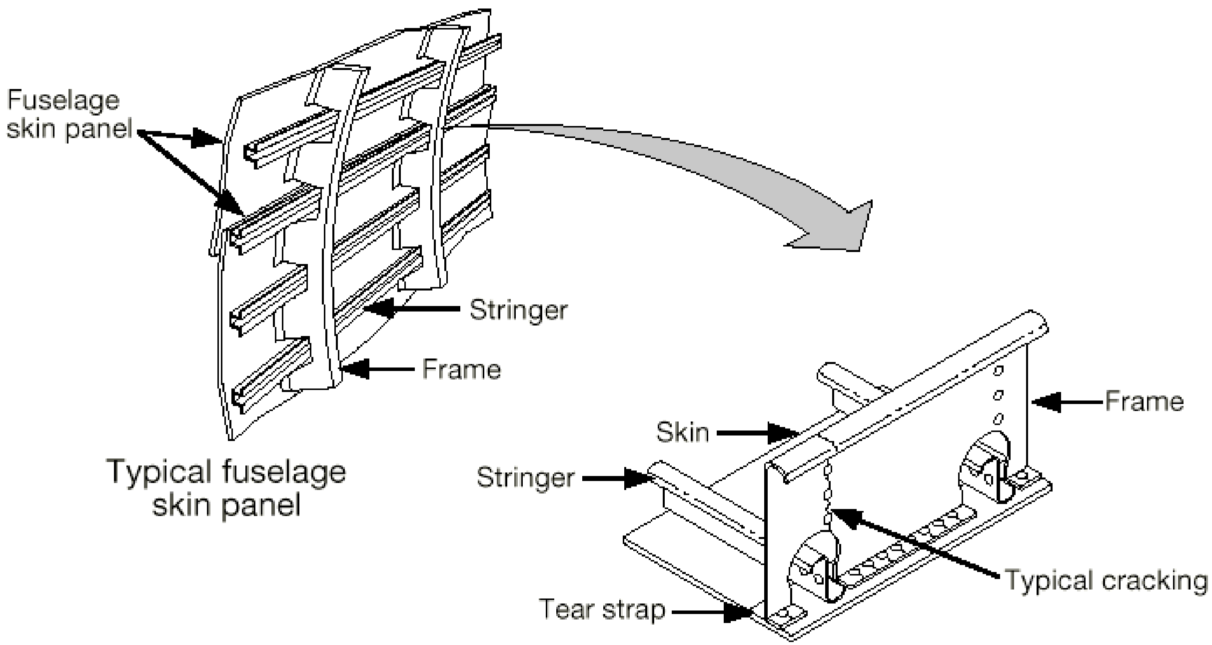
Type and possible location of MSD/MED

- MSD/MED—outer ring splice
  - Attachment profiles—at fastener rows and/or in radius area
- MED—web splices
  - Bulkhead skin and/or splice plates—at critical fastener rows

Service or test experience of factors that influence MSD and/or MED (examples)

- Corrosion
- High stresses—combined tension and compression
- High induced bending in radius
- Inadequate finish in radius—surface roughness

MED Example
Fuselage Frames



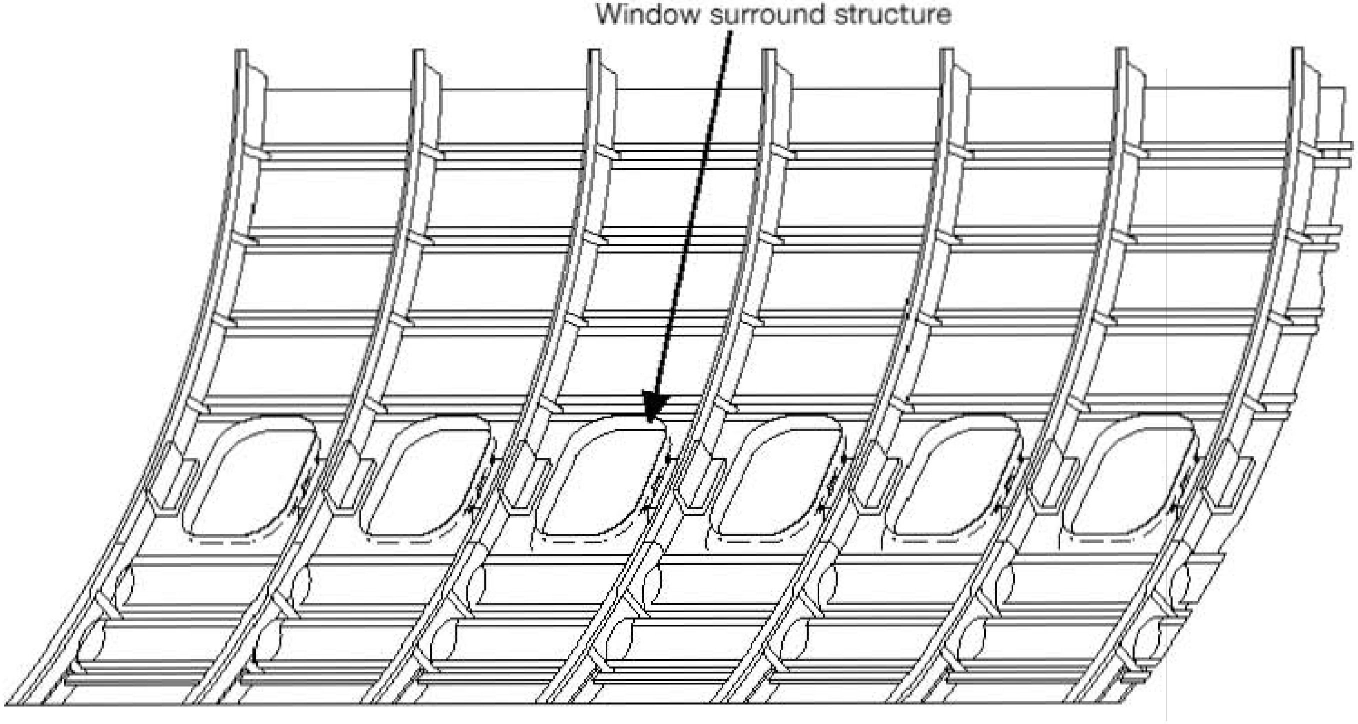
Type and possible location of MSD/MED

- MED—the cracking of frames at stringer cutouts at successive longitudinal locations in the fuselage. The primary concern is for those areas where noncircular frames exist in the fuselage structure. Fractures in those areas would result in panel instability.

Service or test experience of factors that influence MSD and/or MED (examples)

- High bending—noncircular frames
- Local stress concentrations
  - Cutouts
  - Shear attachments

MSD/MED Example
Window surround Structure



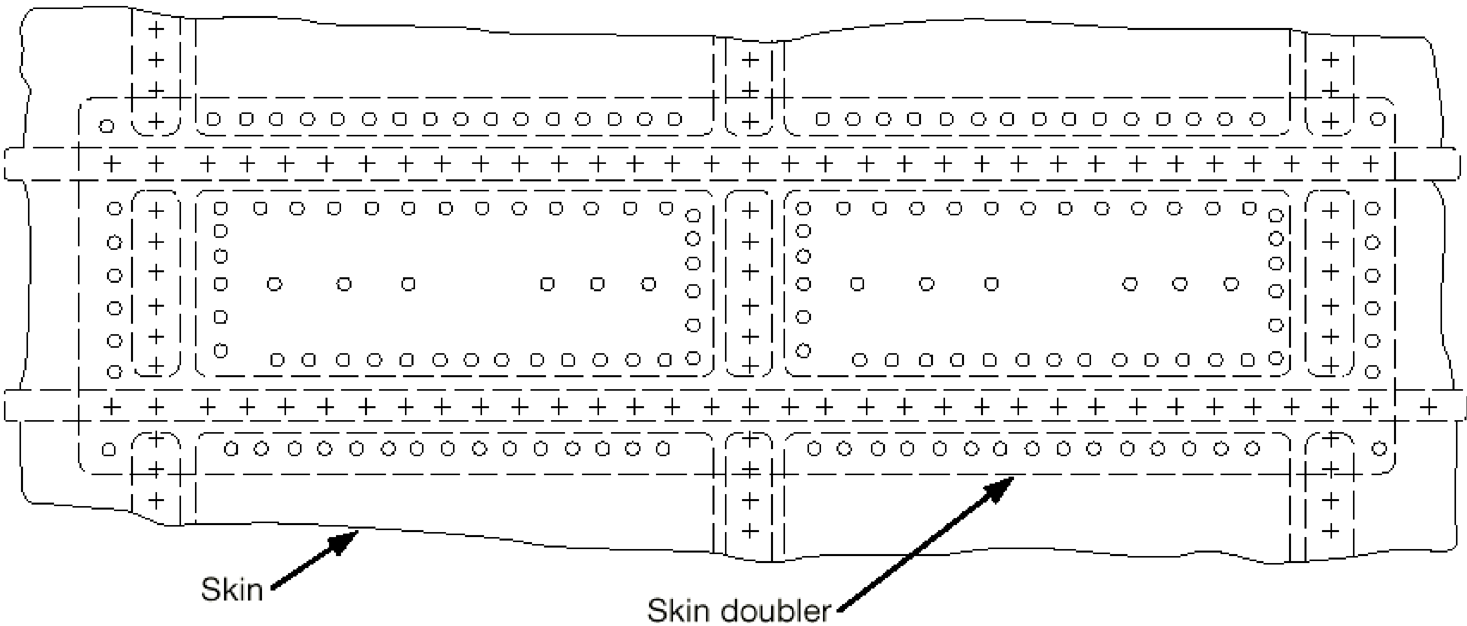
Type and possible location of MSD/MED

- MSD—skin at attachment to window surround structure
- MED—repeated details in reinforcement of window cutouts or in window corners

Service or test experience of factors that influence MSD and/or MED (examples)

- High load transfer

MSD Example
Skin at Run-out of Large Doubler



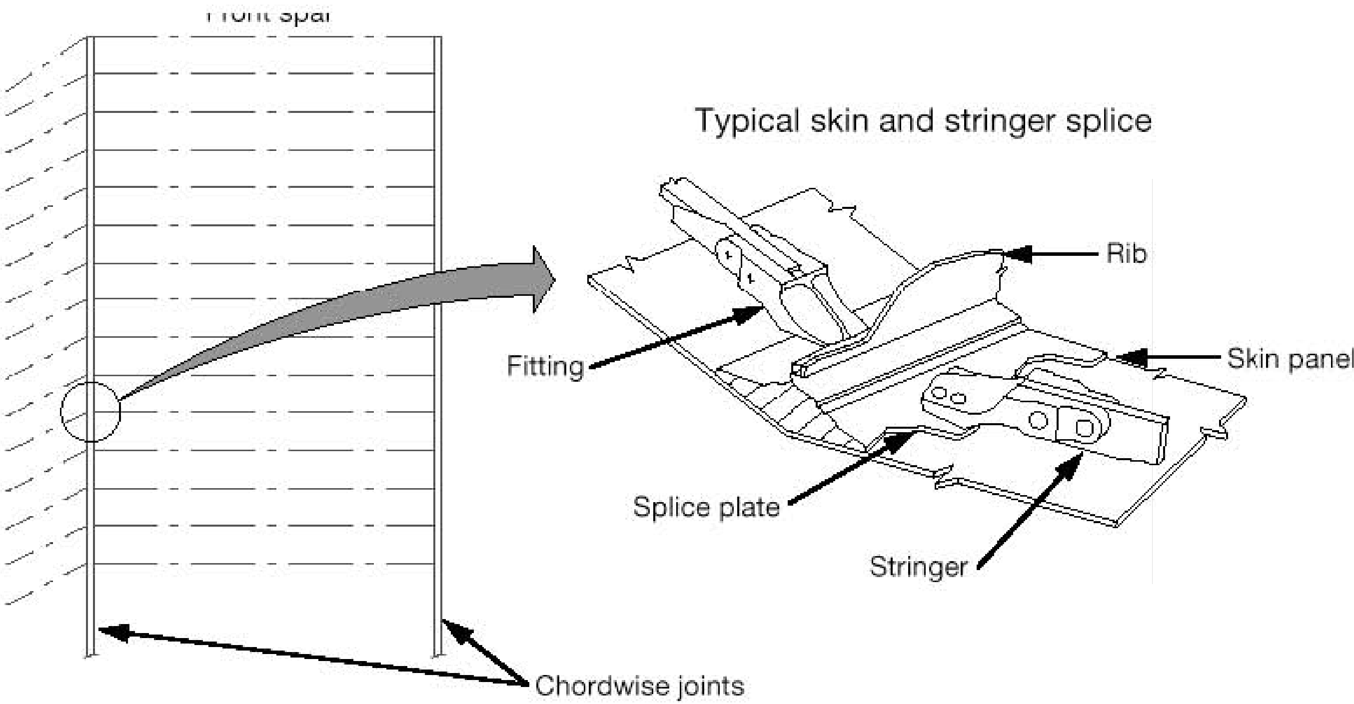
Type and possible location of MSD/MED

- MSD—cracks initiated at multiple critical fastener holes in skin at runout of doubler

Service or test experience of factors that influence MSD and/or MED (examples)

- High load transfer—high local stress

MSD/MED Example
Wing or Empennage Chordwise Splices



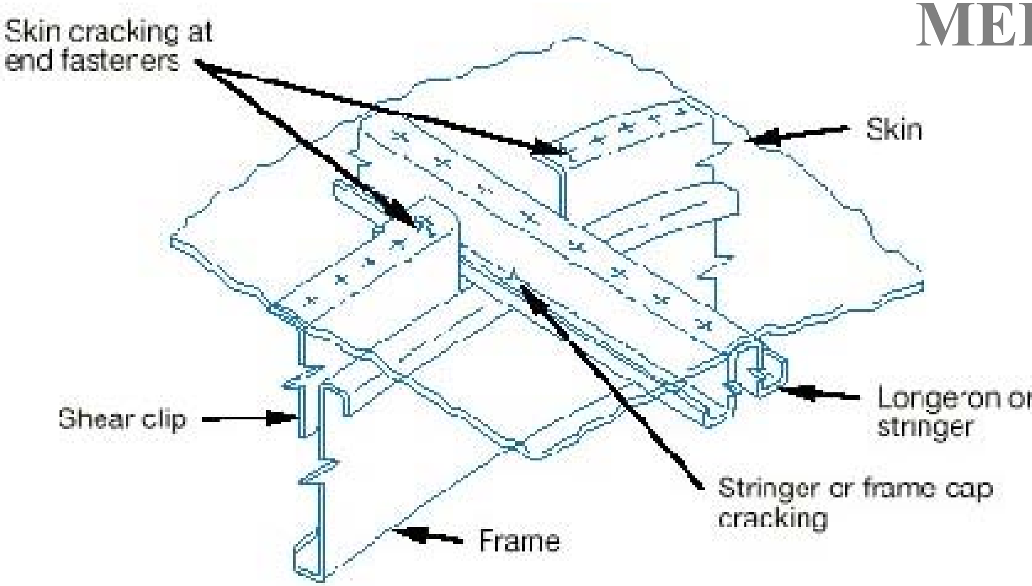
Type and possible location of MSD/MED

- MSD—skin and/or splice plate
  - Chordwise critical fastener rows
- MED—stringer runout of fitting
  - Fatigue-critical fastener holes at stringer and/or fitting

Service or test experience of factors that influence MSD and/or MED (examples)

- High load transfer
- Local bending

MED/MSD Example Fuselage Frame Shear Clips



Type and possible location of MSD and MED

- MSD—skin at end fastener of shear clip
- MED—cracking in stringer or longeron at frame attachment
- MED—cracking in frame at stringer or longeron attachment

Service or test experience of factors that influence MSD and MED (examples)

- Preload
- Localized bending due to pressure
- Discontinuous load path

WFD Evaluation

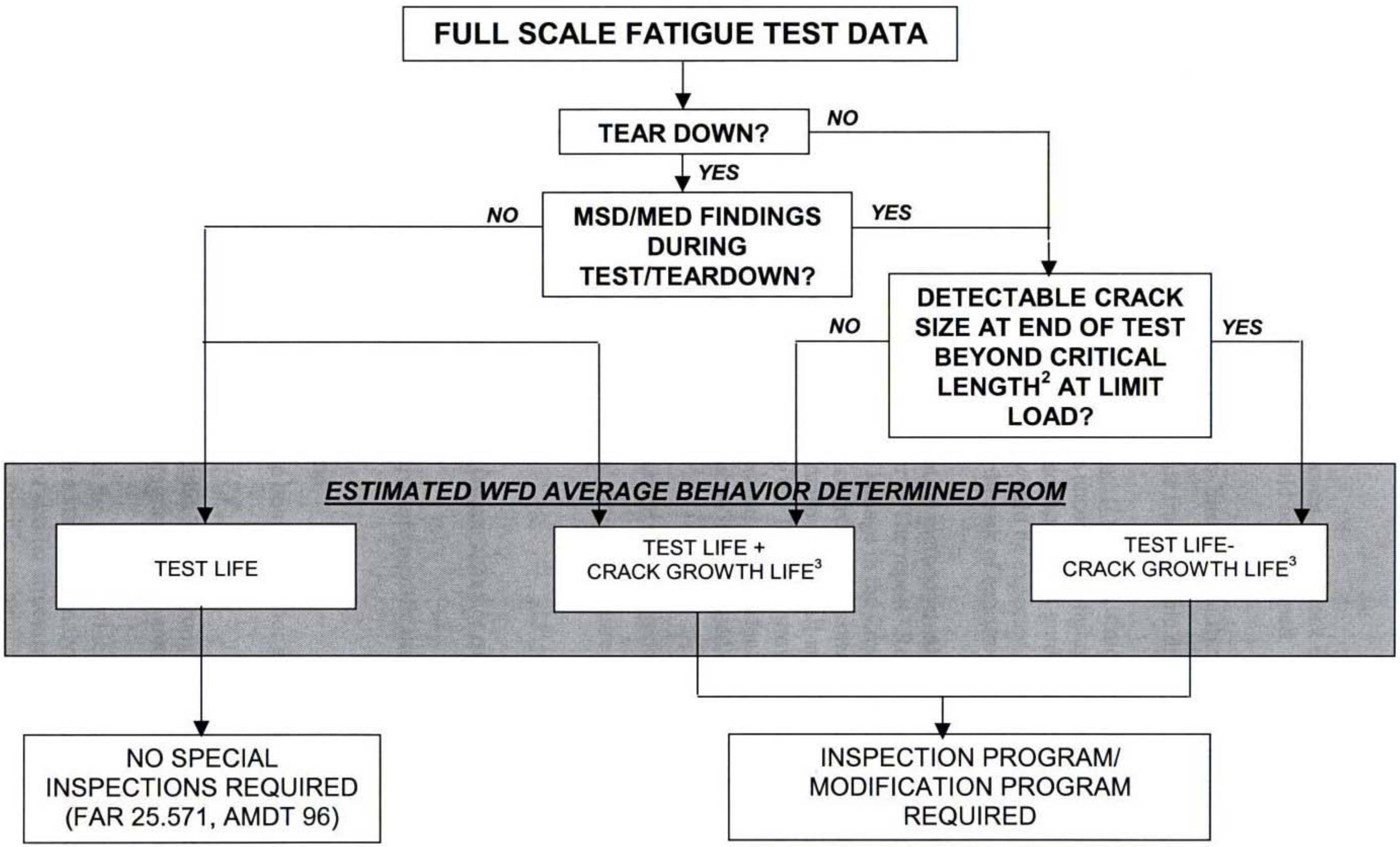
Continued

- Having established the susceptible areas for an airplane model the following are determined
  - WFD Average Behavior
  - Initial Crack/Damage Scenario
  - Final Cracking Scenario
  - Crack Growth Characteristics
  - Structural Modification Point (SMP)
  - Inspection Start Point (ISP)

WFD Evaluation

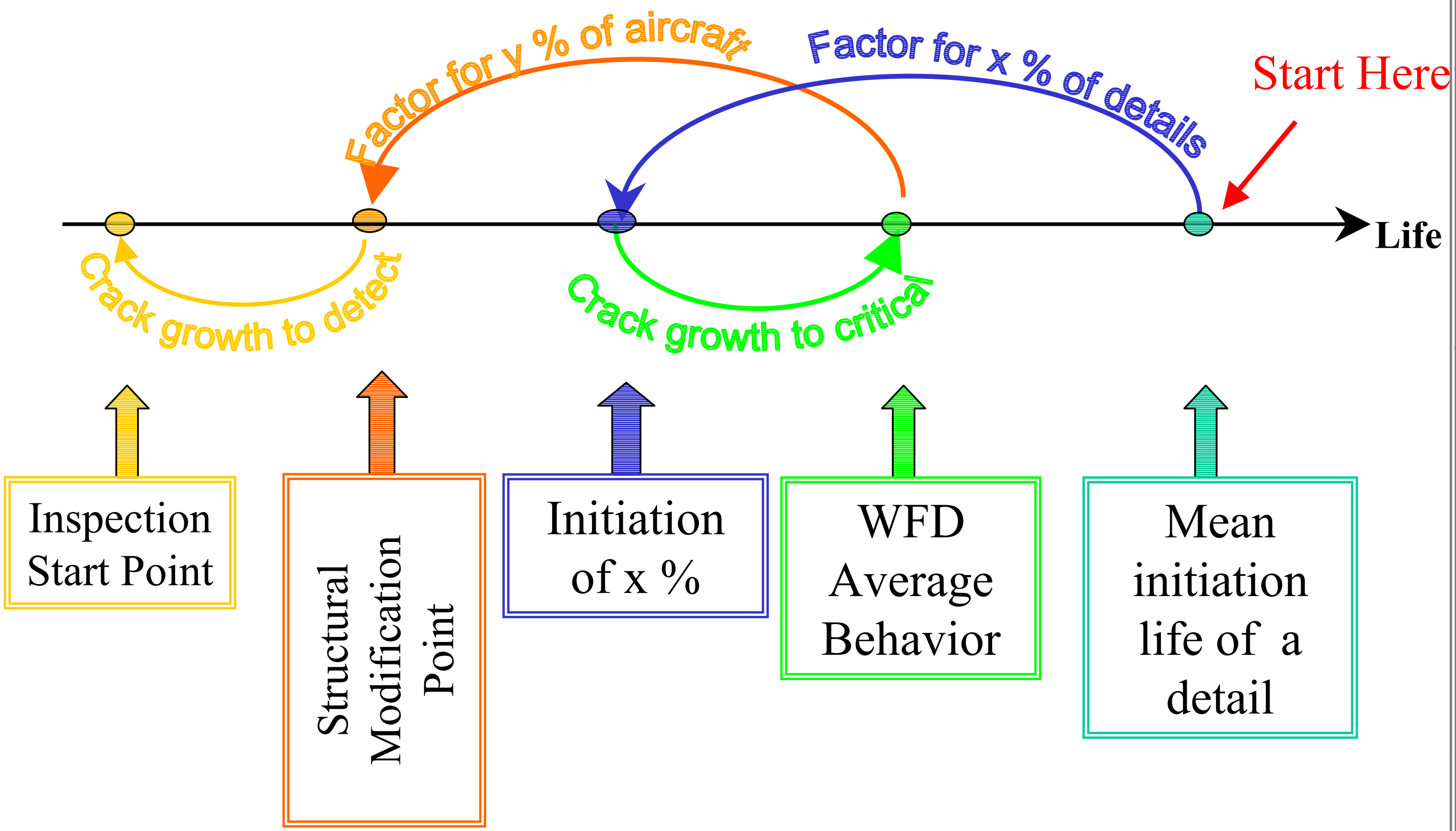
Continued

- **Determination of WFD average behavior in the fleet for the detail**
  - The time in terms of flight cycles/hours to the WFD_{av} in the fleet should be established. The evaluation should include:
    - a complete review of the service history of the susceptible areas (including operational statistics of the fleet in terms of flight hours and landings),
    - significant production variants (material, design, assembly method, and any other change that might affect the fatigue performance of the detail),
    - relevant full-scale and component fatigue test data,
    - teardown inspections, and any fractographic analysis available.
- The evaluation of the test results for the reliable prediction of the time to when WFD might occur in each susceptible area should include appropriate test-to-structure factors.
- The following figure shows how that fatigue test data might be reduced in determining WFD Average Behavior. ……..



Role of Test Data in determining WFD Average Behavior

Representative Analysis Flow



WFD Evaluation

Continued

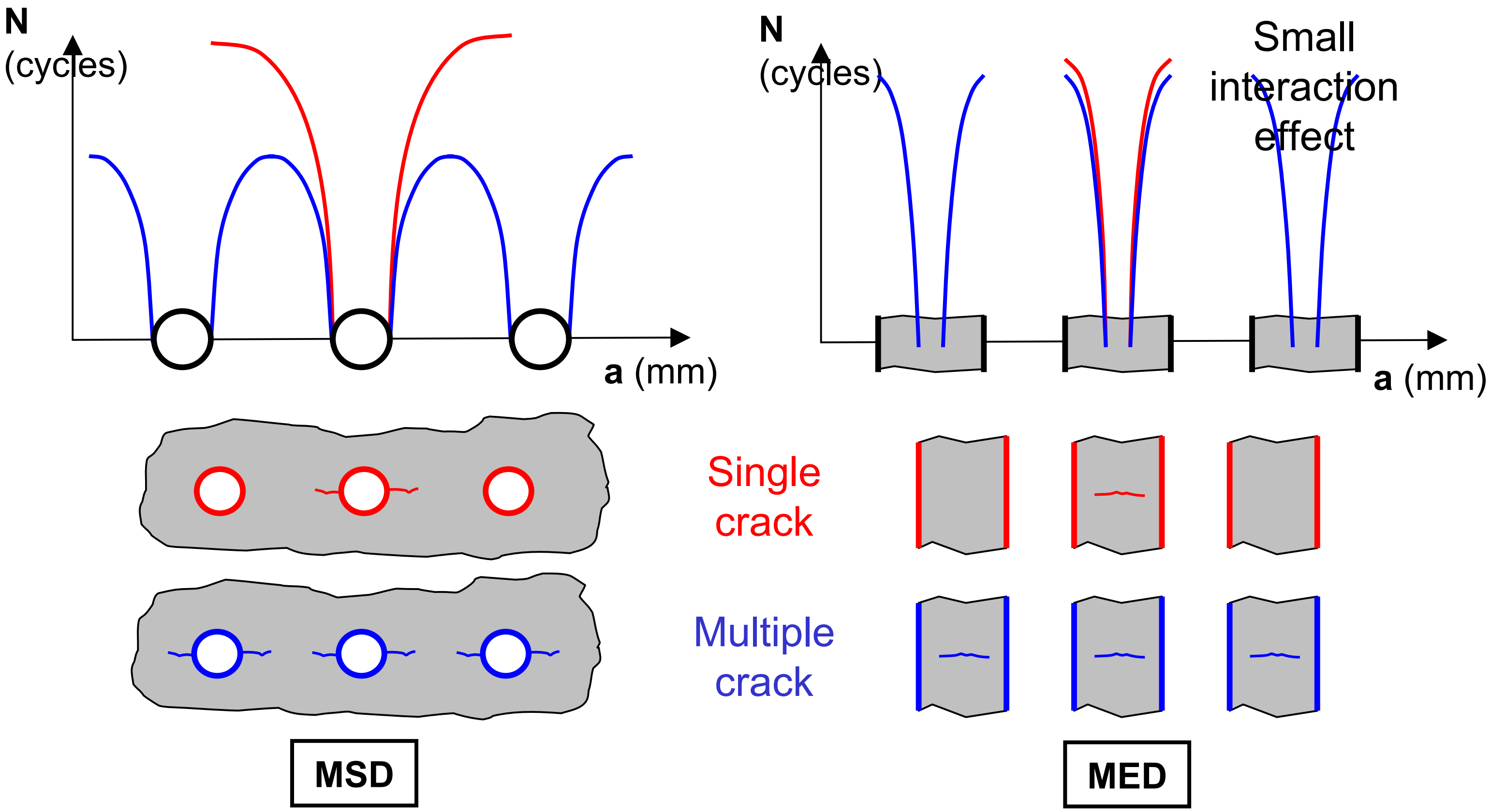
- **Initial Crack/Damage Scenario**
  - This is an estimate of the size and extent of multiple cracking expected at MSD/MED initiation.
  - This prediction requires empirical data or an assumption of the crack/damage locations and sequence plus fatigue evaluation to determine the time to MSD/MED initiation.
  - Alternatively, analysis can be based on either:
    - a distribution of fatigue damage determined from relevant fatigue tests and/or service experience.
    - Monte Carlo simulation
    - the distribution of equivalent initial flaws, as determined from analytical assessment of flaws found during fatigue test and/or teardown inspections regressed to zero cycles; or

WFD Evaluation

Continued

- **Final Cracking Scenario**
  - This is the estimate of the size and extent of multiple cracking that could cause residual strength to fall to certification levels.
  - Techniques exist for 3-D elastic-plastic analysis of such problems; however there are several alternative test and analysis approaches available that provide an equivalent level of safety:
    - Define the final cracking scenario as a sub-critical condition (e.g. first crack link-up at limit load).
    - Use of a subcritical scenario reduces the complexity of the analysis and, in many cases, will not greatly reduce the total crack growth time.
  - Interaction effects must be accounted for ………

Interaction Effects



WFD Evaluation

Continued

- **Crack Growth Characteristic**
  - Progression of the crack distributions from the initial cracking scenario to the final cracking scenario should be developed. These curves can be developed:
    - *analytically*, typically based on linear elastic fracture mechanics, or
    - *empirically*, from test or in-service fractographic data.

WFD Evaluation

Continued

- **Potential For Discrete Source Damage (DSD)**
  - A structure susceptible to MSD/MED may also be affected by DSD due to an uncontained failure of high-energy rotating machinery (i.e., turbine engines).
  - The approach used by the applicant should ensure the damage sizes and densities, that normally would be expected to exist at the structural modification point (SMP), would not significantly change the risk of catastrophic failure due to DSD.

WFD Evaluation

Continued

Analysis Methodology

- The evaluation methods used to determine the WFD average behavior and associated parameters will vary.
- A series of Round Robin exercises undertaken by several TC and STC holders and presented to an authorities review team
  - Provided insight into their respective methodologies for both MSD and MED sources of WFD.
  - Prediction of WFD is primarily an initiation problem whereas classical damage tolerance is a crack propagation issue
  - An important outcome of the exercises was an identification of key assumptions or methods that had the greatest impact on the prediction of WFD behavior……….

WFD Evaluation

Continued

Parameters impacting WFD prediction

- statistics used to evaluate the fatigue behavior of the structure e.g., time to crack initiation
- establishing equivalency to a 2 lifetime fatigue test
- initial distribution of flaws
- the flaw sizes assumed at initiation of crack growth phase of analysis
- crack growth equations used
- detectable flaw size assumed
- failure criteria adopted
- material properties used (static, fatigue & fracture)
- methods of determining the structure modification point (SMP)
- lower bound behavior as opposed to mean behavior assumed.

WFD Evaluation

Continued

- The following parameters are developed in the WFD Structural Evaluation for the area under investigation and are necessary to establish a revised maintenance program
- WFD is precluded by establishing
  - a Structural Modification Point (SMP)
- Precautionary inspections, where viable, are introduced at
  - an Inspection Start Point (ISP)
- Along with
  - Inspection techniques and intervals appropriate to the structural area

WFD Evaluation

Continued

- **Structural Modification Point (SMP)**
  - The SMP established during the evaluation has to have the same confidence level as current regulations require for new certification.
  - In lieu of other acceptable methods, the SMP can be established as a point reduced from the WFD Average Behavior
    - by dividing by a factor of 2 if there are viable inspections,
    - or by a factor of 3 if inspections are not viable.
  - Whichever approach is used to establish the SMP, a check should be made to demonstrate that the approach ensures that with the expected extent of MSD/MED at SMP the structure still has a Large Damage Capability [LDC]
  - The LDC check is to ensure that normal maintenance will be able to address damage from sources such as accidental damage, or environmental degradation before they become critical.
  - An airplane may not be operated past any SMP unless the relevant structural feature is modified or replaced.

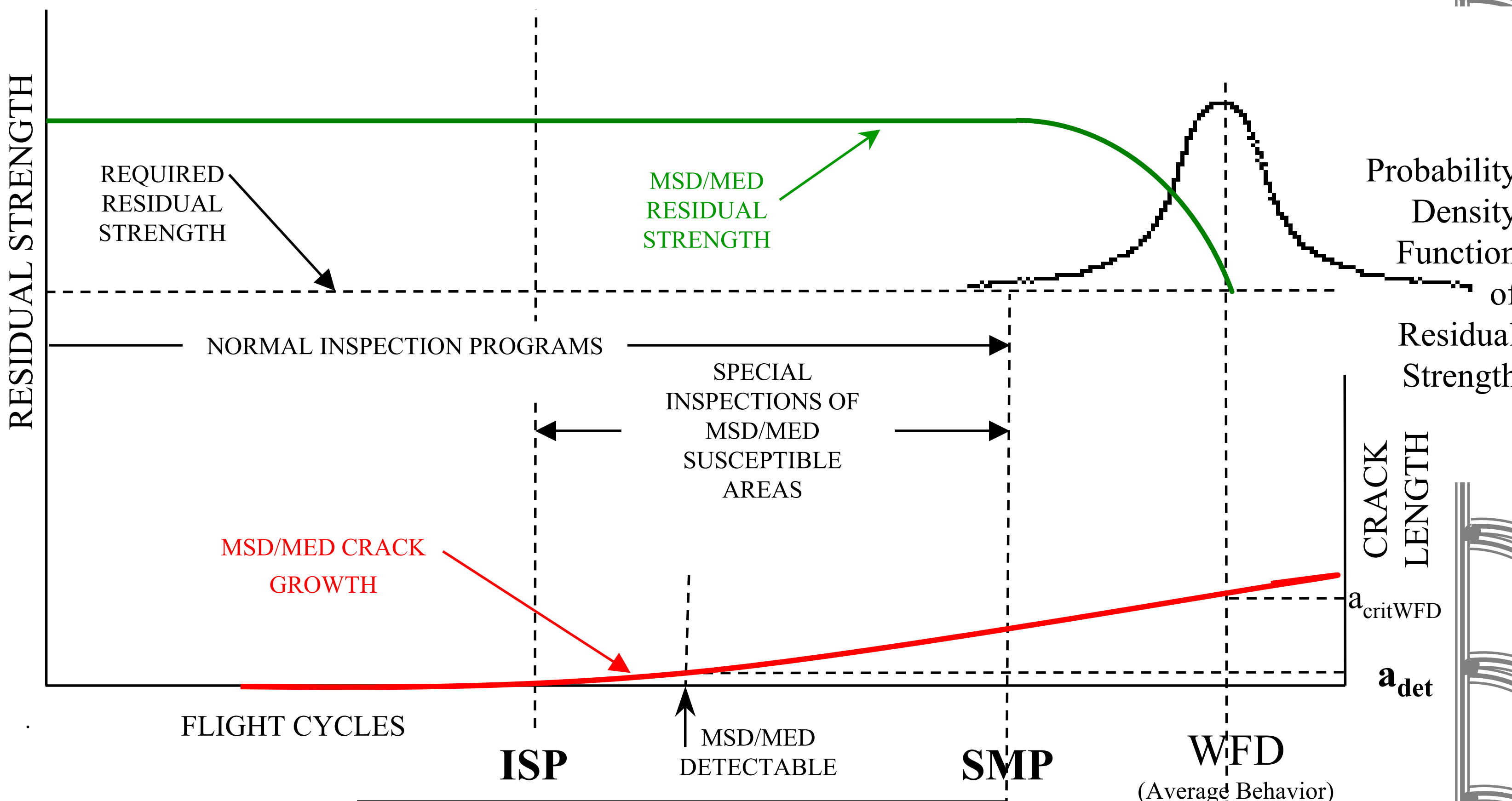
WFD Evaluation

Continued

- **Inspection Start Point (ISP)**
  - It is determined through a statistical analysis of crack initiation based on fatigue testing, teardown, or service experience of similar structural details.
  - It is assumed that the ISP is equivalent to a lower bound value with a specific probability in the statistical distribution of cracking events.
  - Alternatively, the ISP may be established by applying appropriate factors to the average behavior.

- The relationship between WFD average behavior, SMP and ISP is shown schematically in the following figure ……………

ISP and SMP Determination



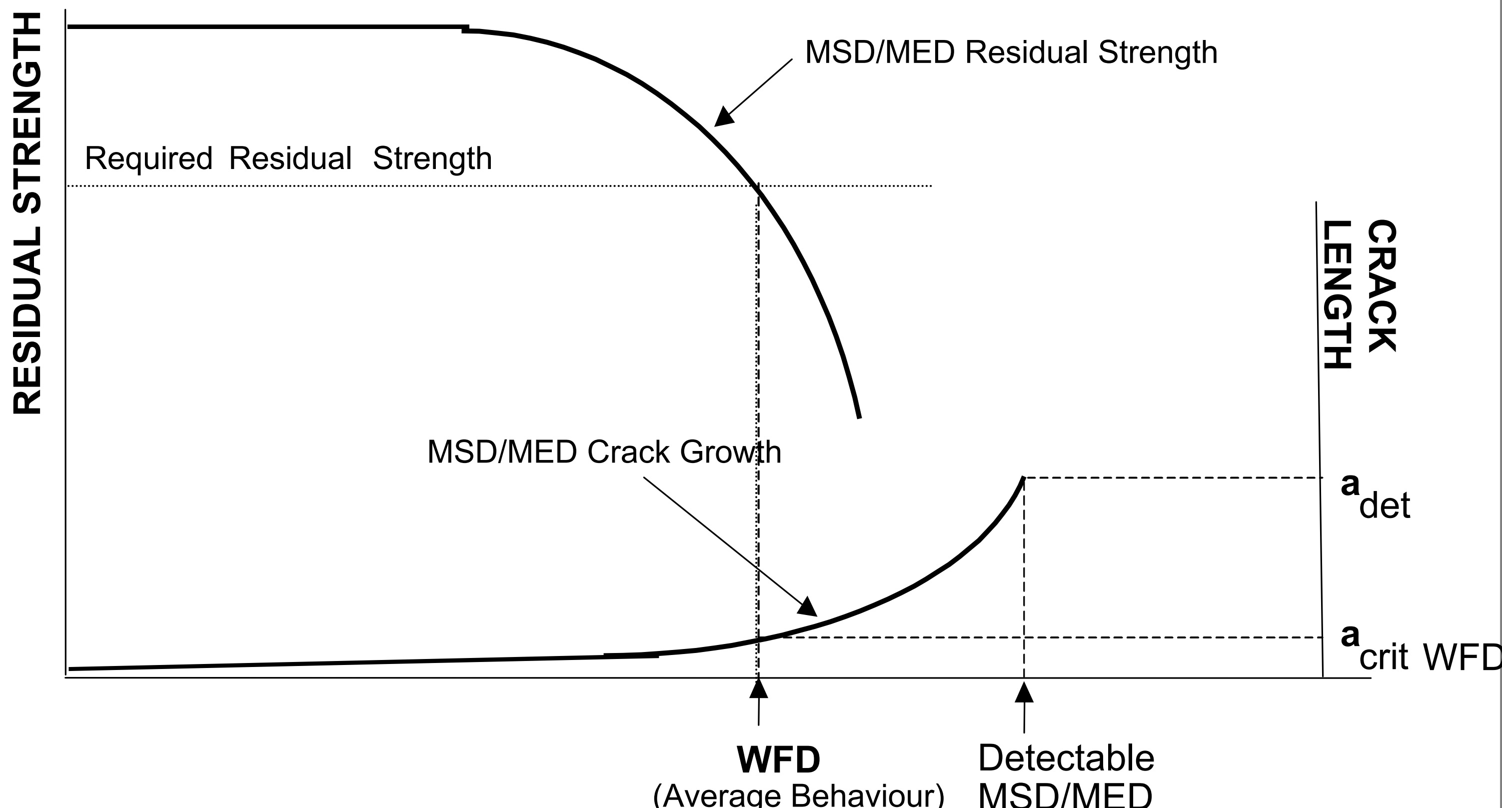
Reduction to provide equivalent
Protection to a 2-Lifetime fatigue test

WFD Evaluation

Continued

- **Inspection Interval and Method**
  - An interval should be chosen to provide a sufficient number of inspections between the ISP and the SMP so that there is a high confidence that no MSD/MED condition will reach the final cracking scenario without detection.
  - The interval is highly dependent on the detectable crack size and the probability of detection associated with the specific inspection method.
  - If the crack detection is not viable, see next figure , the SMP must be reevaluated to ensure there is a high confidence level that no airplane will develop MSD/MED before modification.
- Action if Cracks found
  - If cracks are found in any susceptible structural detail either under inspection or the modification program, the SMP should be reevaluated
  - If required confidence level is not met, the SMP should be adjusted
  - Backed up by appropriate service bulletin action to address the condition of the fleet. -- Additional regulatory action may be required.

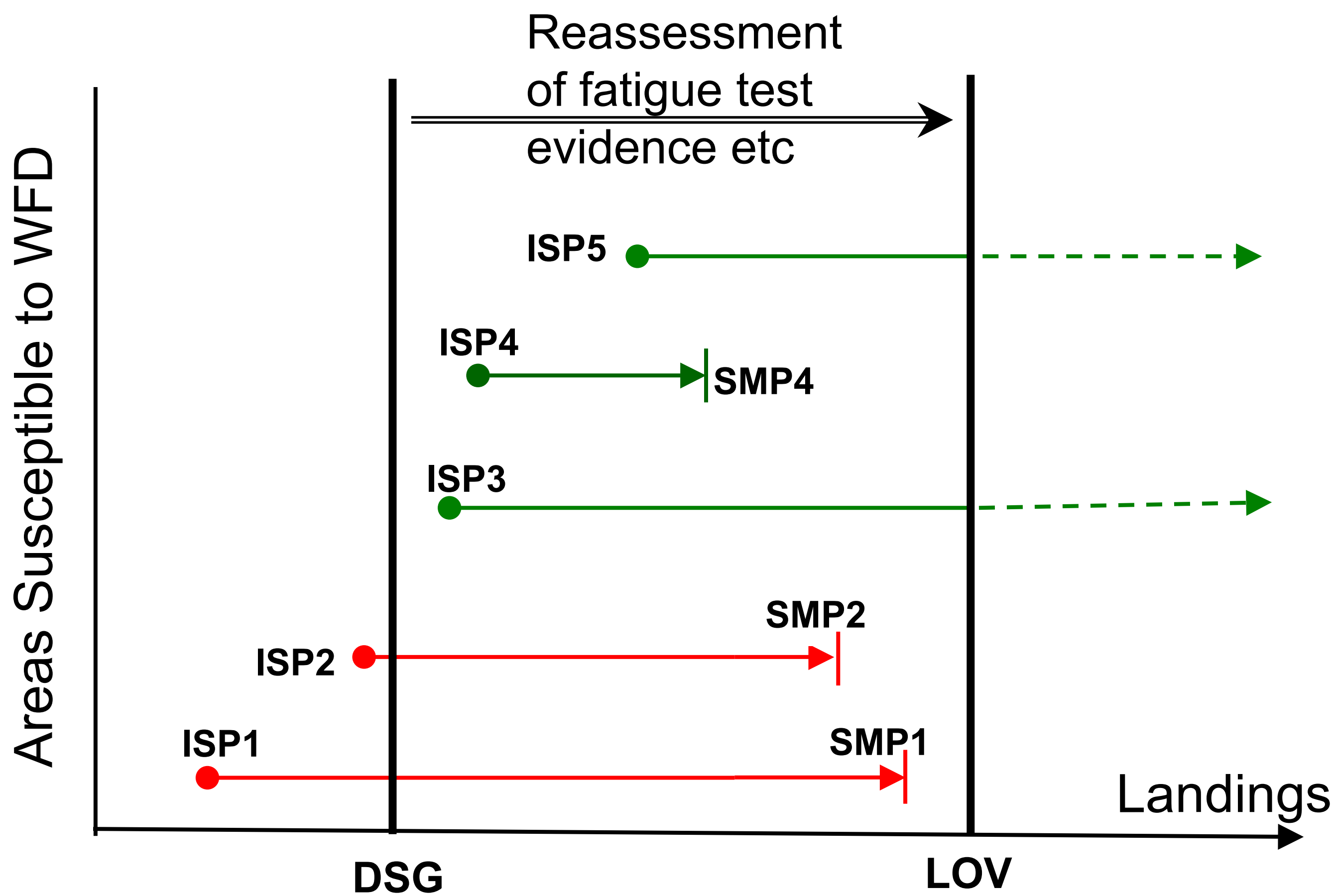
Situation of ISP non-viable



LOV, SMP, ISP, and the WFD Program

- LOV is an airplane level number, it refers to the capability of the total airplane
- ISP and SMP are component level numbers and refers to the capability of a component of the airplane.
- The diagram that follows shows a hypothetical outcome of a WFD evaluation in which
  - The LOV has to go into the ALS for the airplane
  - ISP3, ISP4, ISP5, SMP1, SMP2, & SMP4 are maintenance program actions for the components
  - ISP1 & ISP2 are potential AD action.

WFD Maintenance Program Requirements



RAMs

- Repairs , alterations and modifications [RAMs] have to be addressed as well as baseline structure
- Interaction between a RAM and the baseline structure also has to be covered
- The technical considerations are the same in each case but the rule allows a longer timescale to complete.
  - Provided that a plan for completion is submitted to FAA
- The WFD program for RAMs is the operators responsibility especially as the TCH may have no knowledge of the RAM.
  - However it is expected that TCHs will provide generic guidelines for operators.

Examples of RAMs to consider

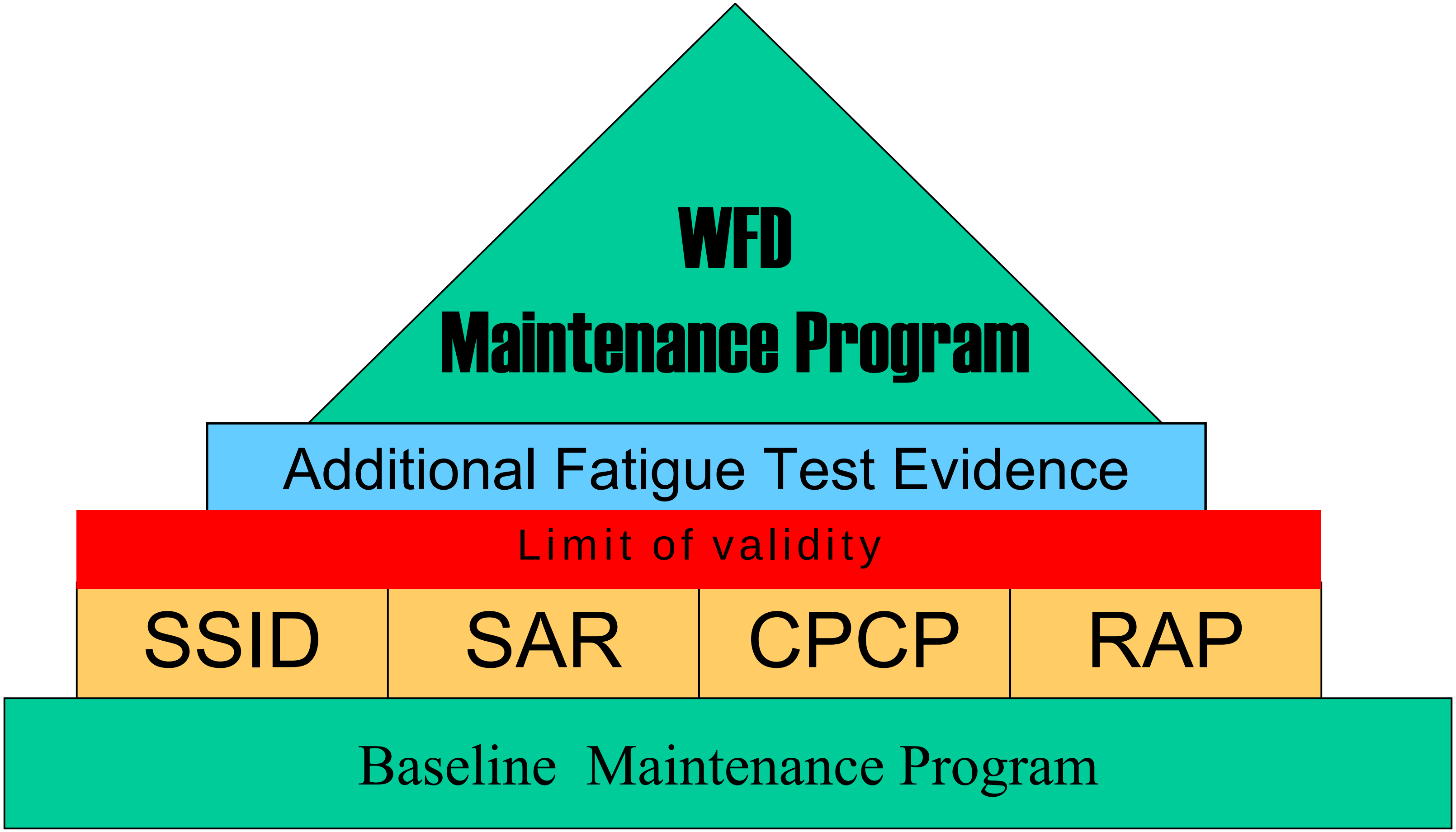
- Passenger-to-freighter conversions (including addition of main deck cargo doors
- Gross weight increases (increased operating weights, increased zero fuel weights, increased landing weights, and increased maximum takeoff weights).
- Installation of fuselage cutouts (passenger entry doors, emergency exit doors or crew escape hatches, fuselage access doors, and cabin window relocations).
- Complete re-engine or pylon modifications
- Engine hush-kits and nacelle alterations
- Wing modifications such as installing winglets or changes in flight control settings (flap droop), and alteration of wing trailing edge structure
- Modified, repaired, or replaced skin splices

Other potential areas to consider

- Any modification, repair, or alteration that affects several stringer or frame bays
- A modification that covers structure requiring periodic inspection by the operator's maintenance program
- A modification that results in operational mission change that significantly changes the manufacturer's load or stress spectrum.
- A modification that changes areas of the fuselage from being externally inspectable using visual means to being uninspectable.

The Format of the WFD Program Maintenance Documents

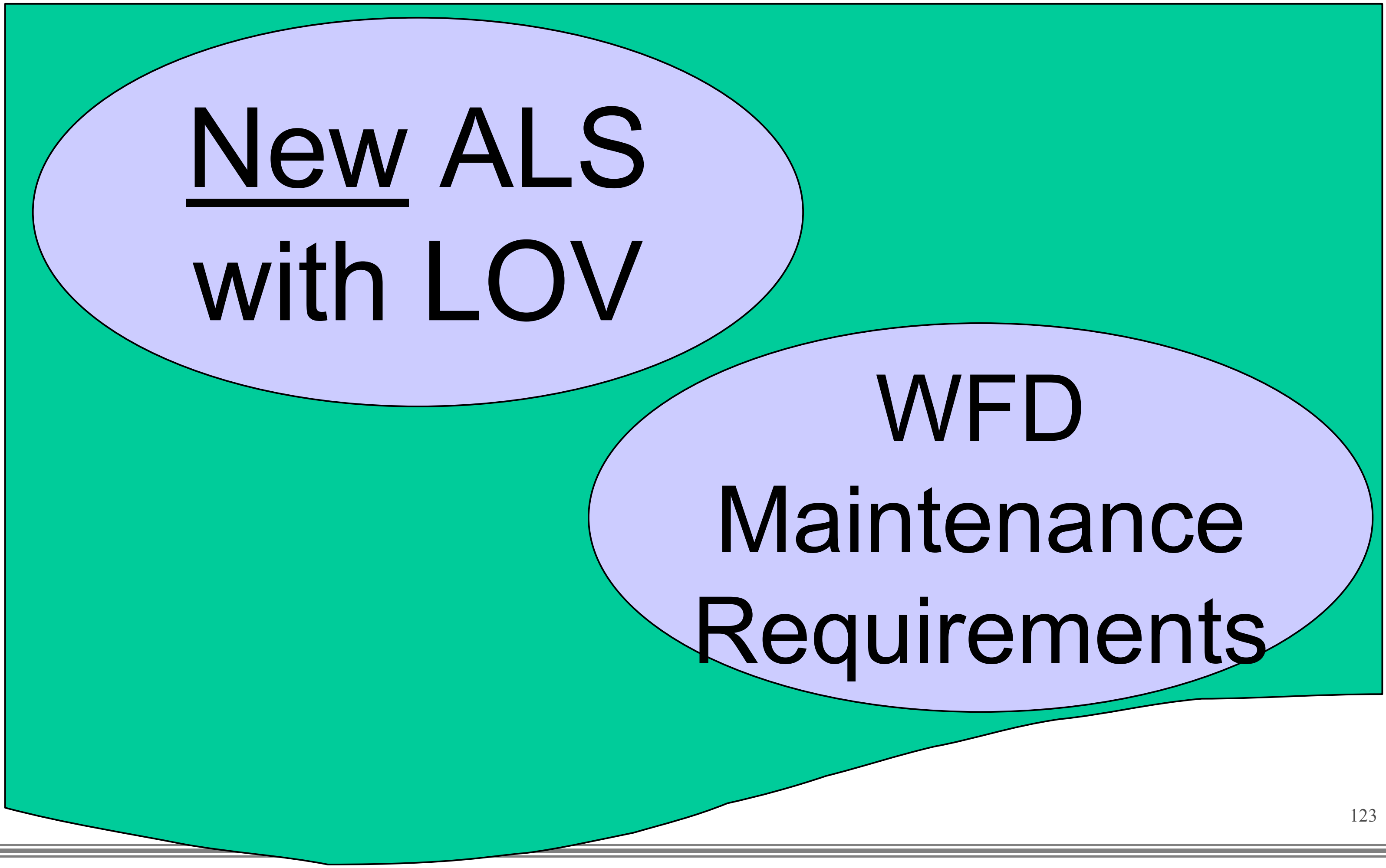
Operation Beyond Initial Limit Of Validity

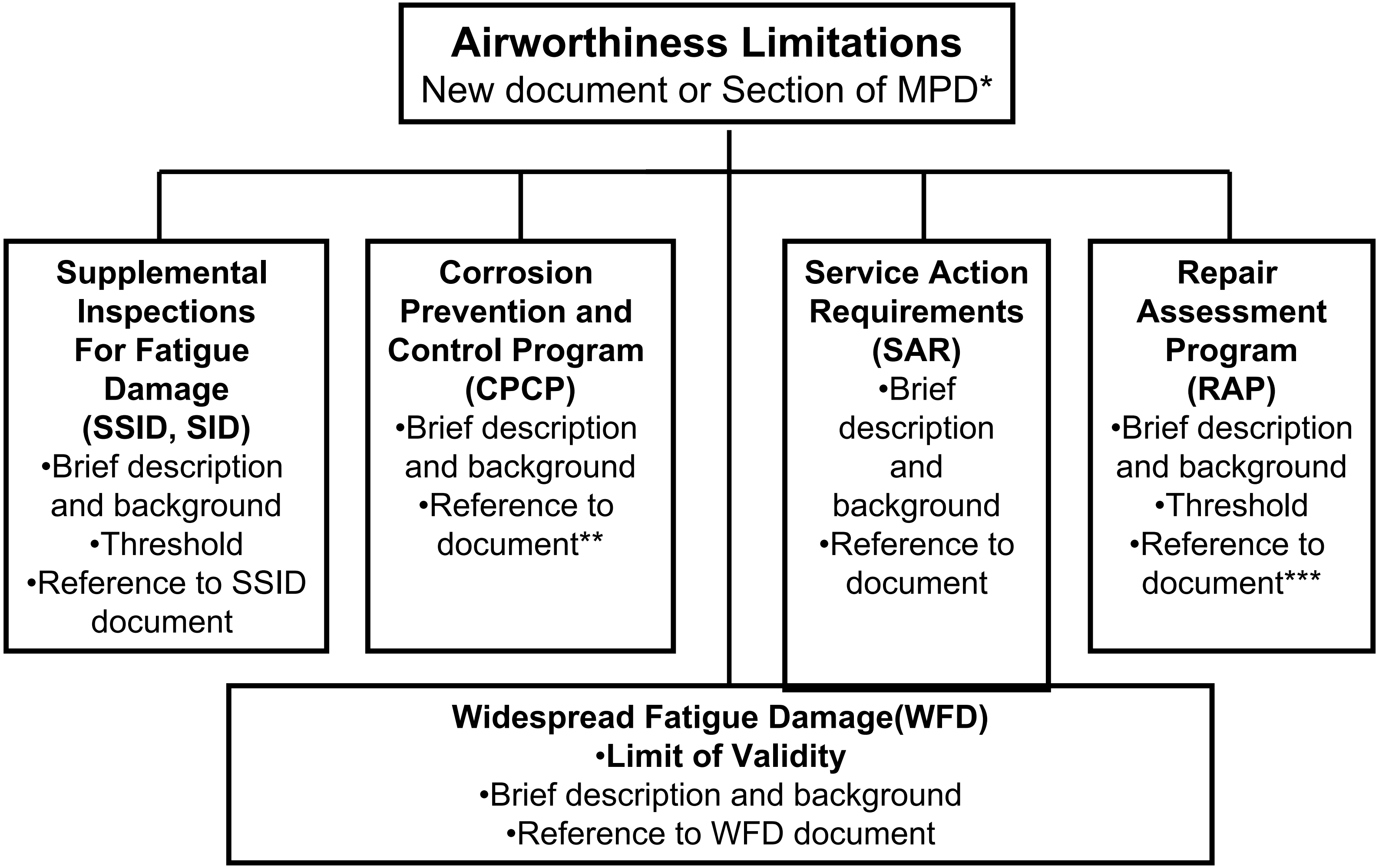


WFD Maintenance Program

- Typical Generic Contents
  - Susceptible structure with WFD concern
    - Picture, description, area number, station location and affected airplanes
  - Inspection Start Point (ISP)
  - Inspection methods and intervals
  - Structural Modification Point (SMP)
  - Description of modification required at SMP
  - Other references (Aging Airplane programs, SB’s, AD’s)

Pre-Amendment 45 Airplanes



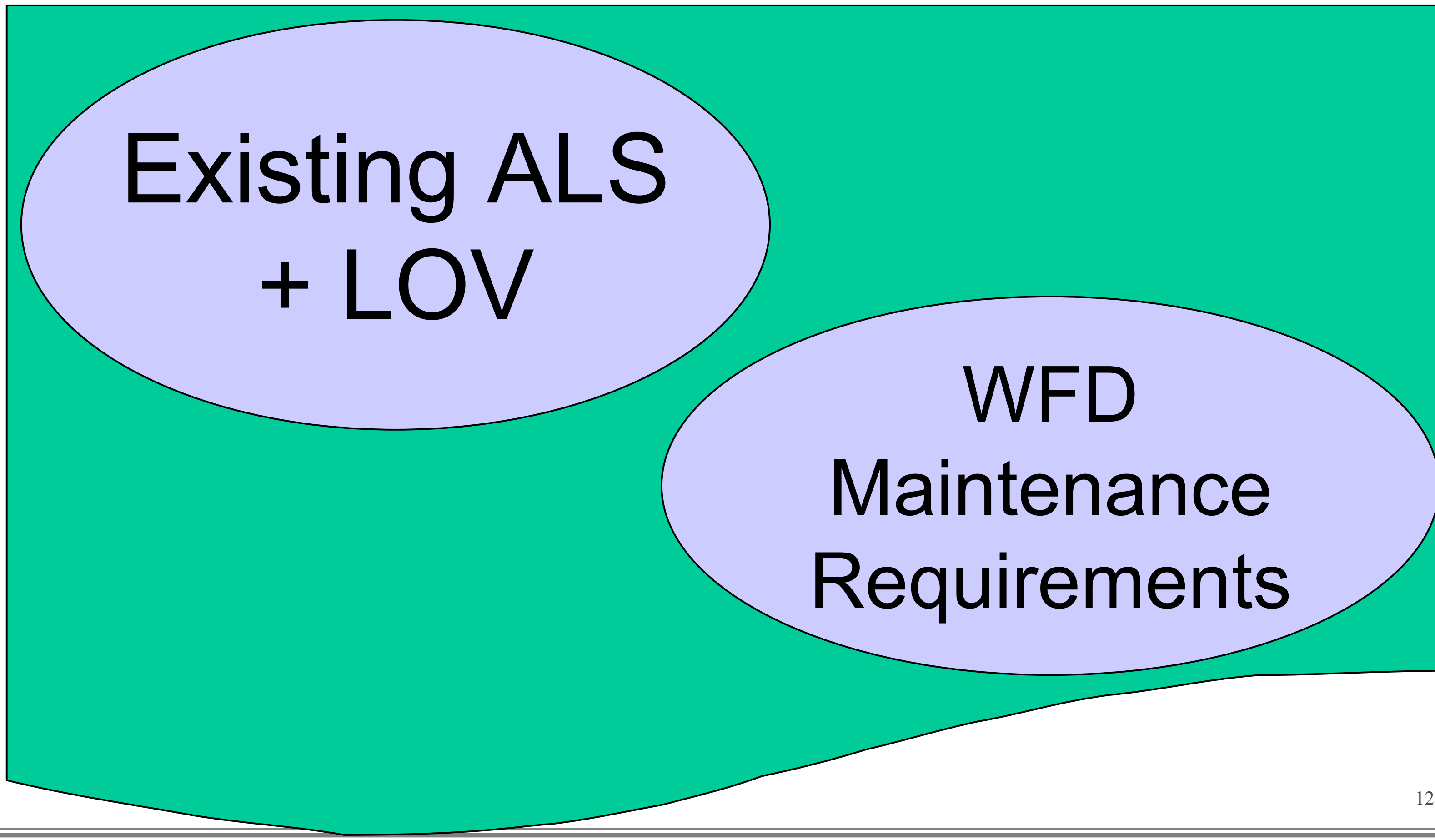


* ACO Approved

** Or equivalent program which controls corrosion to Level 1 or better

*** Or equivalent FAA approved program

Post-Amendment 54 Airplanes



Example of ALS "Pointer"

Service Action Requirements

A necessary prerequisite for continuing any MODEL airplane(s) beyond the number of flights listed in this ALI/ALS as the initial Limit of Validity (LOV) is an inspection and modification program to prevent structural failure of due to fatigue or corrosion in areas with known service problems.

The emphasis of this program is on selection of service bulletins for mandatory modification however in some cases existing evidence will not be sufficient to require mandatory modification but instead lead to a mandating an inspection program.

The MODEL Service Action Requirements Program provides a list of service bulletins on which mandatory modifications must be accomplished at a specified threshold listed in the document for each service bulletin. Development of the MODEL SAR has been carried out under the guidance of a MODEL STG/MTG Working Group made up of airline, manufacturer and FAA personnel. The program provides continuing structural integrity for aging transport airplanes by evaluating current structural service bulletins and determining which should be mandated prior to an established threshold.

The Service Action Requirements Document referenced below lists the Service Bulletins that define the mandatory inspection and modification requirements as well as delineating the procedures necessary for their accomplishment. The information contained in the SAR document describing the effected airplanes and the details of the required work should be considered only a summary. The most recent revisions to the Service Bulletins should be consulted to determine which airplanes are affected and for the detailed work scope.

Regulatory Requirement

The FAA has mandated accomplishment of this program by way of Airworthiness Directive. Check Airworthiness Directive listings for latest Airworthiness Directive that mandates this program.

Documents References

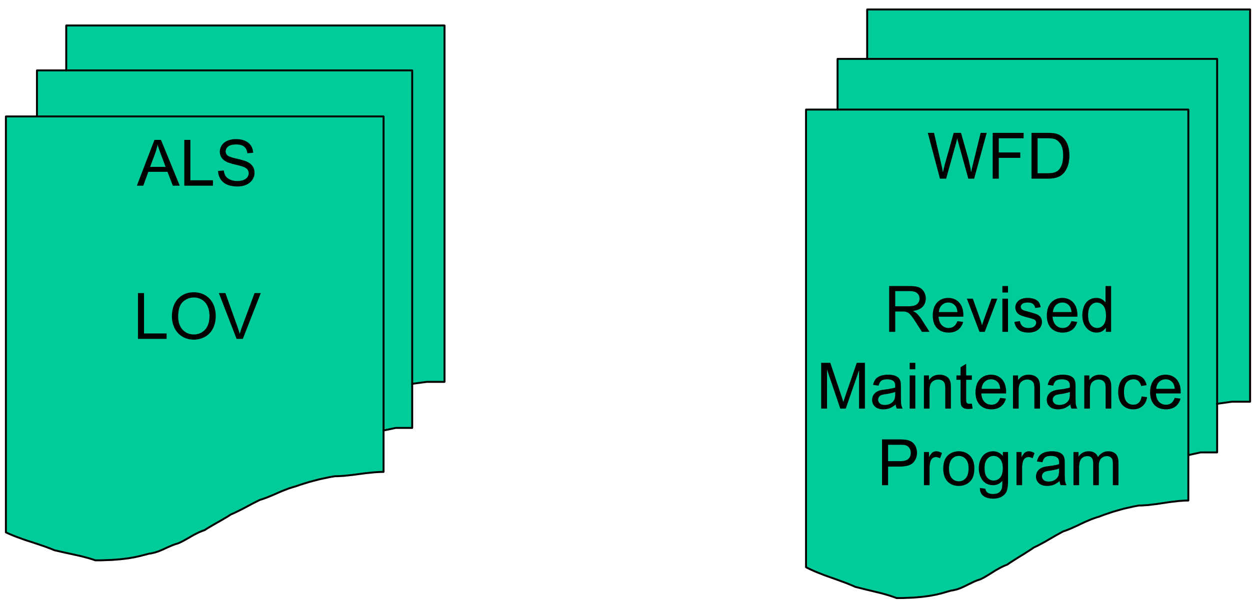
Example

DC-8 Aging Aircraft Service Action Requirements Document Report Number MDC-K1579 and has been approved to meet the requirements of FAA AD.

Requests for the document should be directed to Boeing Commercial Aviation Group, Data Services Management

Document Contents

- Documentation that is intended to meet proposed FAA requirements



WFD Document Outline

I. Title: Prevention of Widespread Fatigue Damage

II. Front Matter
   a. List of Effective Pages
   b. Table of Contents

III. Implementation
   a. Introduction of Terms
   b. Reference to LOV(s) contained in ALS

IV. Lists of Service Bulletins
   a. List 1 required to implement at LOV1
   b. List 2 required to implement at LOV2
   c. Etc.

V. Lists of Inspections (those not contained in an S/B)
   a. List 1 required to implement at LOV1
   b. List 2 required to implement at LOV2
   c. Etc.

WFD Document Outline

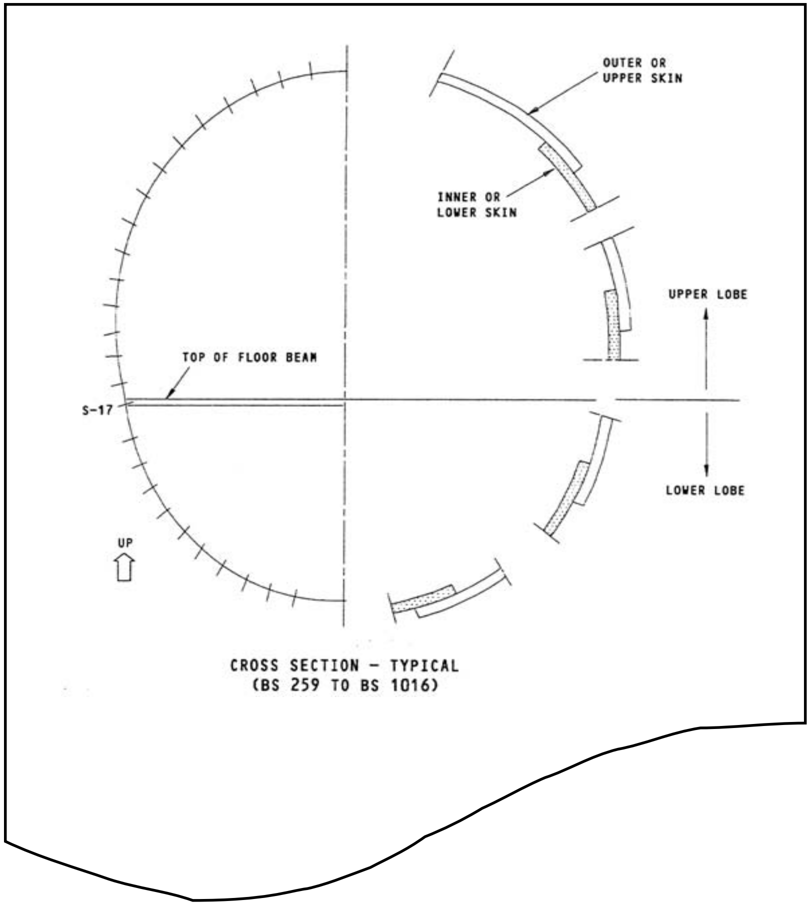
Continued

VI. General Information
   a. Program History
   b. Descriptions of MSD, MED, etc.
   c. Analysis Basis (overview only)
      i. Summary of Fatigue Tests and Teardowns
      ii. Description of Fleet Demonstrated Life
      iii. Determination of ISP and SMP

VII. Glossary of Terms

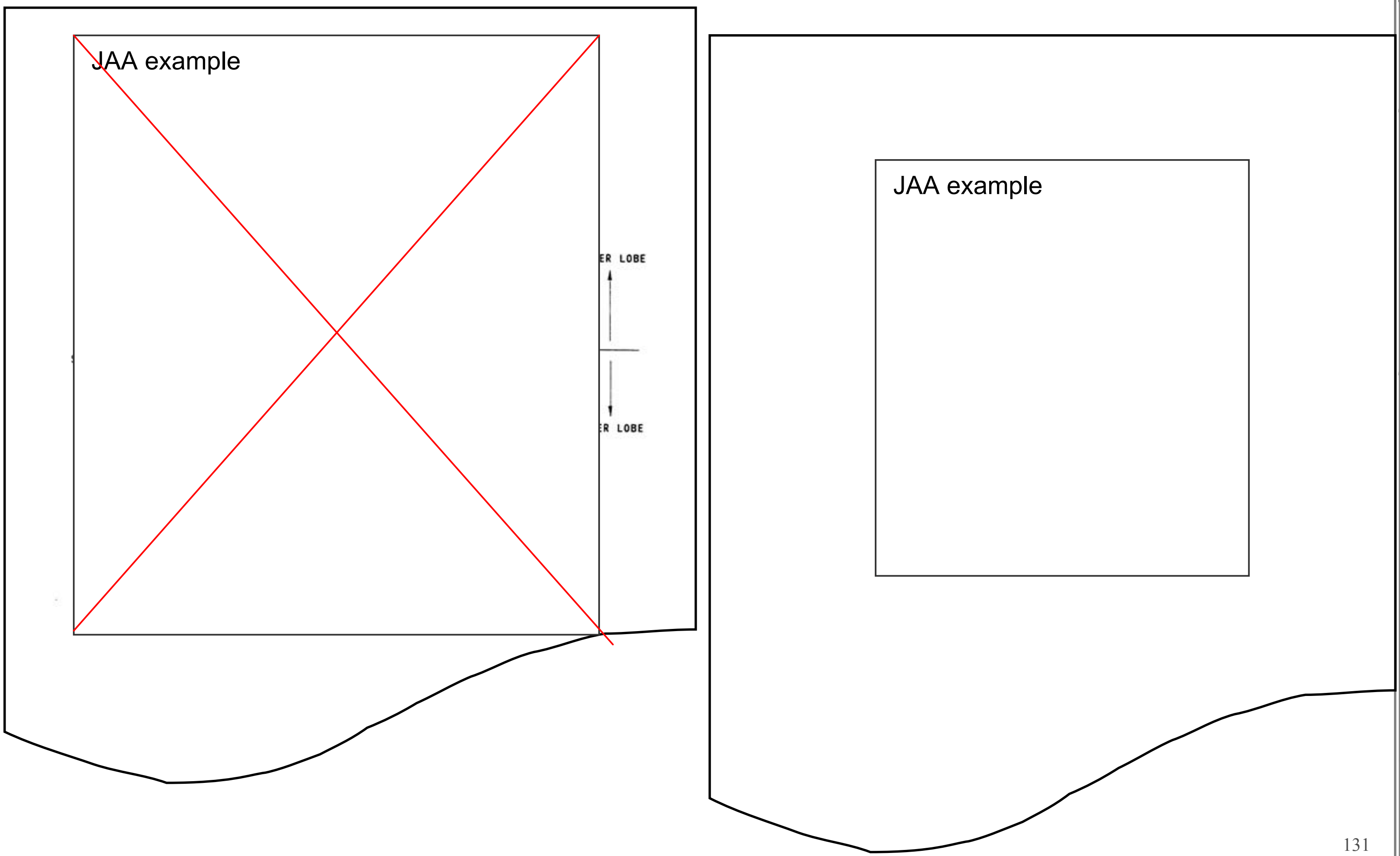
VIII. References

WFD Document Format Example 1



SUSCEPTIBLE AREA:	FUSELAGE SKIN LONGTITUDINAL LAP SPLICES BS 259 TO BS 1016 ABOVE STRINGER S-17
SUSCEPTIBLE AREA NUMBER:	WFD.737.001
AIRPLANES AFFECTED:	ALL
ISP:	TBD
INSP. METHOD AND REF:	1) EDDY CURRENT - NDT MANUAL D6-37239, PART 6, 53-30-10 2) EDDY CURRENT - NDT MANUAL D6-37239, PART 6, 53-30-00
INSP. INTERVAL OR REF:	1) TBD 2) TBD
SMP:	TBD
MOD. DESCRIPTION AND REF:	

WFD Document Format Example 2



Responsibilities

- The following charts are provided to indicate the responsibilities for the various aspects of the WFD Evaluation Program
  - The ALS
  - The LOV
  - ISP and SMP
  - RAMs and Plan

Responsibilities Continued

	TCH	ACO (TC cognizant)	AEG	Operator	PMI
Operation After Effective Date of WFD Regulation					
ALS	**Develops ALS w/LOV(s) (most cases)**	Reviews and Approves ALS (and subsequent changes)	Reviews and Accepts ALS (and subsequent changes)	Incorporates FAA approved ALS into Ops Specs	Facilitates incorporation of ALS into Ops Specs
If Operator chooses to operate beyond initial LOV					
WFD Program - Baseline Structure	Develops WFD Program (most cases)	Reviews and Approves WFD Program (and subsequent changes)	Reviews and Accepts WFD Program (and subsequent changes)	Incorporates WFD Program into Ops Specs	Facilitates incorporation of WFD Program into Ops Specs

Responsibilities Continued

	TCH	ACO (TC cognizant)	AEG	Operator	PMI
Repair, Alterations and Modifications (RAMs)	Develops maintenance program documents that contain general guidelines developed along strict boundaries for the screening of repairs and STCs TCH would be responsible for development of RAMs issued under his production certificate (most cases)	Reviews and Approves WFD Program (and subsequent changes)	Reviews and Accepts WFD Program (and subsequent changes)	Incorporates WFD Program into Ops Specs	Facilitates incorporation of WFD Program into Ops Specs

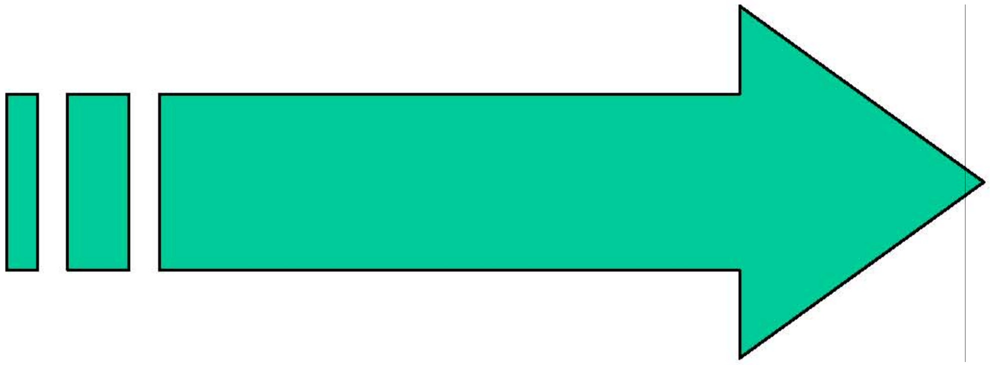
Responsibilities Continued

	TCH	ACO (TC cognizant)	AEG	Operator	PMI
RAMs Plan		Reviews and Approves Plan	Reviews and Accepts Plan	Develops plan to address RAMs for WFD and submits to ACO 1. Surveys airplanes 2. Develops list of susceptible structure 3. Analytical methods used 4. Schedule for developing WFD Program for RAMs	Plan is submitted to ACO through PMI

Responsibilities Continued

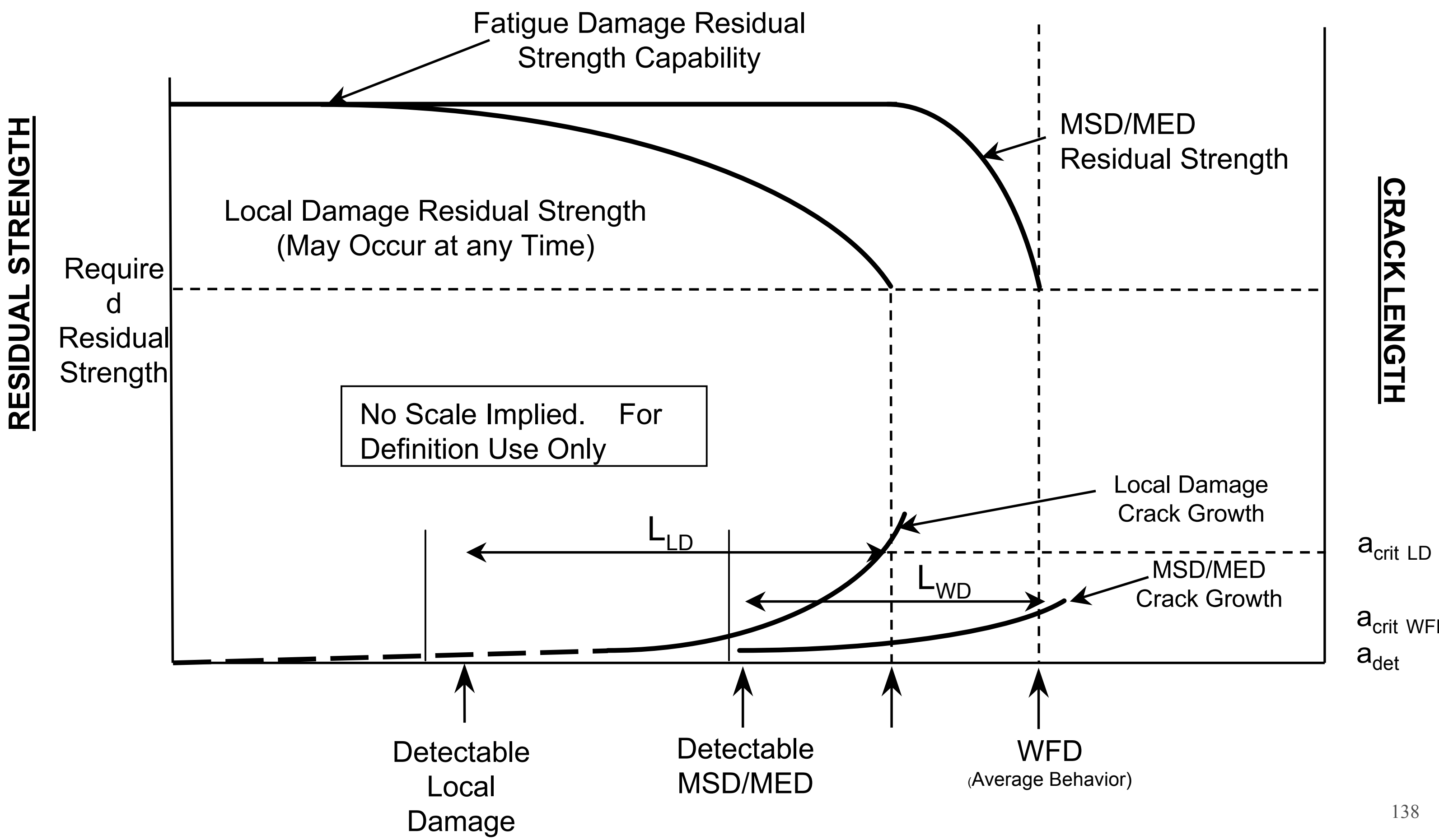
	TCH	ACO (TC cognizant)	AEG	Operator	PMI
Analysis of RAMs				Operator is responsible for ensuring that MSD/MED susceptible RAMs are assessed for WFD. May need to hire necessary expertise to accomplish WFD assessments	
WFD Program - RAMs		Reviews and approves program (and subsequent changes)	Reviews and Accepts program (and subsequent changes)	Submits program to ACO	Program is submitted to ACO through PMI

SCRAP



WFD Evaluation

Continued



Operational Rule for WFD
Continued

- **The 1999 ARAC recommendations for addressing WFD in the fleet prescribed a mandatory structural audit of all large transport category aircraft in order to address the continued safe operation of aging aircraft. The details of this audit process have been developed and are contained in the following proposed documents:**
  - **1. ARAC AAWG Report on “Recommendations for Regulatory Action to Prevent WFD in the Commercial Airplane Fleet” March 11, 1999**
  - **2. Draft 121 and 129 Rule on WFD (to be published)**
  - **3.Draft Advisory Circular 91-56x (to be published)**

Operational Rule for WFD
Continued

- The proposed draft rule amends the regulations to add new requirements to prevent WFD for transport category airplanes with a maximum takeoff gross weight greater than 75,000 lbs.
  - Prohibits operation of an airplane unless an Airworthiness Limitations Section (ALS) is developed or revised that specifies an FAA-approved Limit of Validity (LOV) for the structural maintenance program within 12 months after the effective date of the rule.
    - Requires the establishment of a new ALS if non exists
    - The ALS must be incorporated within the maintenance program.

Operational Rule for WFD
Continued

- For baseline structure, the proposed rule would prohibit operation beyond the initial LOV specified in the ALS, or 12 months after the effective date of the rule, whichever occurs later unless a WFD structural maintenance program is incorporated within its maintenance program
- The WFD program must include inspections and/or modification/replacement actions to the baseline structure for the prevention of WFD and a schedule for accomplishing the specified actions.

Operational Rule for WFD
Continued

- For existing repairs, alterations and modifications (RAMs) the proposed rule would prohibit operation of certain airplanes, after 48 months after initial adoption of the WFD program for the baseline structure or 48 months beyond the time the airplane has accumulated the LOV specified in the ALS, whichever occurs later unless a supplemental WFD (SWFD) in incorporated within its maintenance program.
  - The SWFD program must include inspection and/or modification/replacement actions for RAMs susceptible to multiple site damage (MSD)/multiple element damage (MED) or RAMs that affect structure that is susceptible to MSD/MED accomplished prior to the effective date of the final rule.

Operational Rule for WFD

Continued

- For RAMs installed after the effective date of the rule, the proposed rule would prohibit operation of airplanes, 18 months after the RAM is accomplished unless an appropriate threshold for inspection and/or modification/replacement actions is incorporated within its maintenance program
  - By the threshold inspection methods, repeat intervals and/or modification/replacement actions for the RAM must be FAA-approved and incorporated into the FAA approved structural maintenance program.
  - The structural maintenance program for baseline structure and RAMs, to prevent WFD, should be the result from a structural audit process.

WFD Evaluation

Continued

- **Task 2 To operate an airplane beyond the established LOV, an evaluation of each area susceptible to WFD must be completed. This evaluation would establish the necessary elements to determine a maintenance program to preclude WFD in that particular model's commercial airplane fleet. A typical evaluation process is shown in Figure 2. The elements are developed for each susceptible area and typically include:**

WFD Evaluation

Continued

- **Some of the differences that complicate WFD evaluation include the following:**
  - **Probabilistic analysis of multiple crack initiation has to be considered.**
  - **Lack of test/in-service data to validate assumptions.**
  - **Crack growth analysis must account for sequence of crack initiation and crack interaction.**
  - **Rapid decrease in MSD residual strength as a result of many interacting small cracks. Residual strength analysis is more complex and involves many crack scenarios and failure states.**

ISP and SMP

Continued

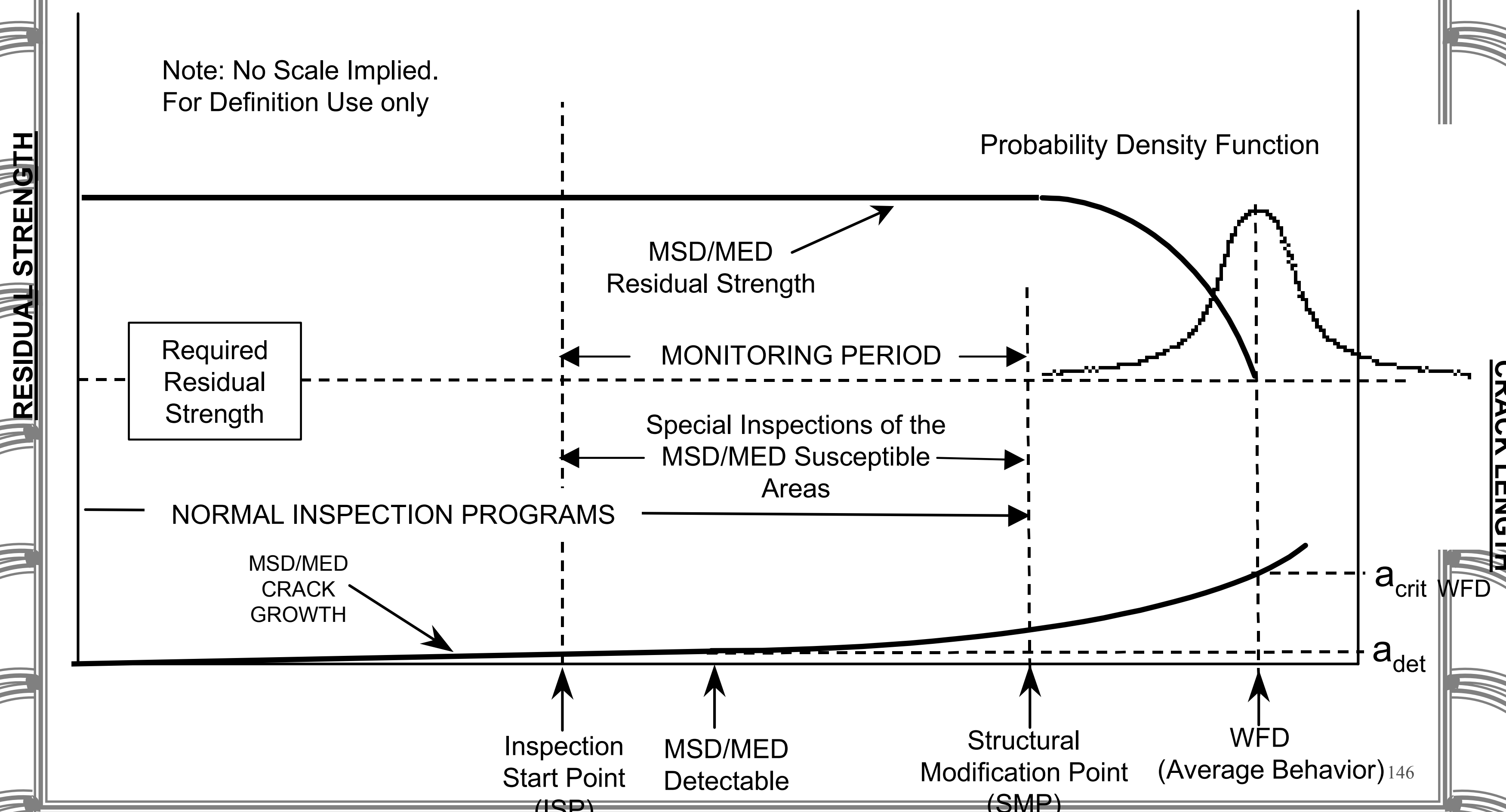


FIGURE 6 ISP is viable - Special Inspections established during monitoring period

Maintenance Program Adjustments

- Definitions
- WFD Susceptible Areas
- Maintenance Program Requirements

Definitions

- There is new terminology for areas susceptible to WFD.
  - ISP

    Inspection Start Point - The point in time when special inspections of the fleet are initiated due to a specific probability of having a specific MSD/MED condition
  - SMP

    Structural Modification Point - A point reduced from the WFD average behavior, so that operation up to that point provides equivalent protection to that of a two-lifetime fatigue test.

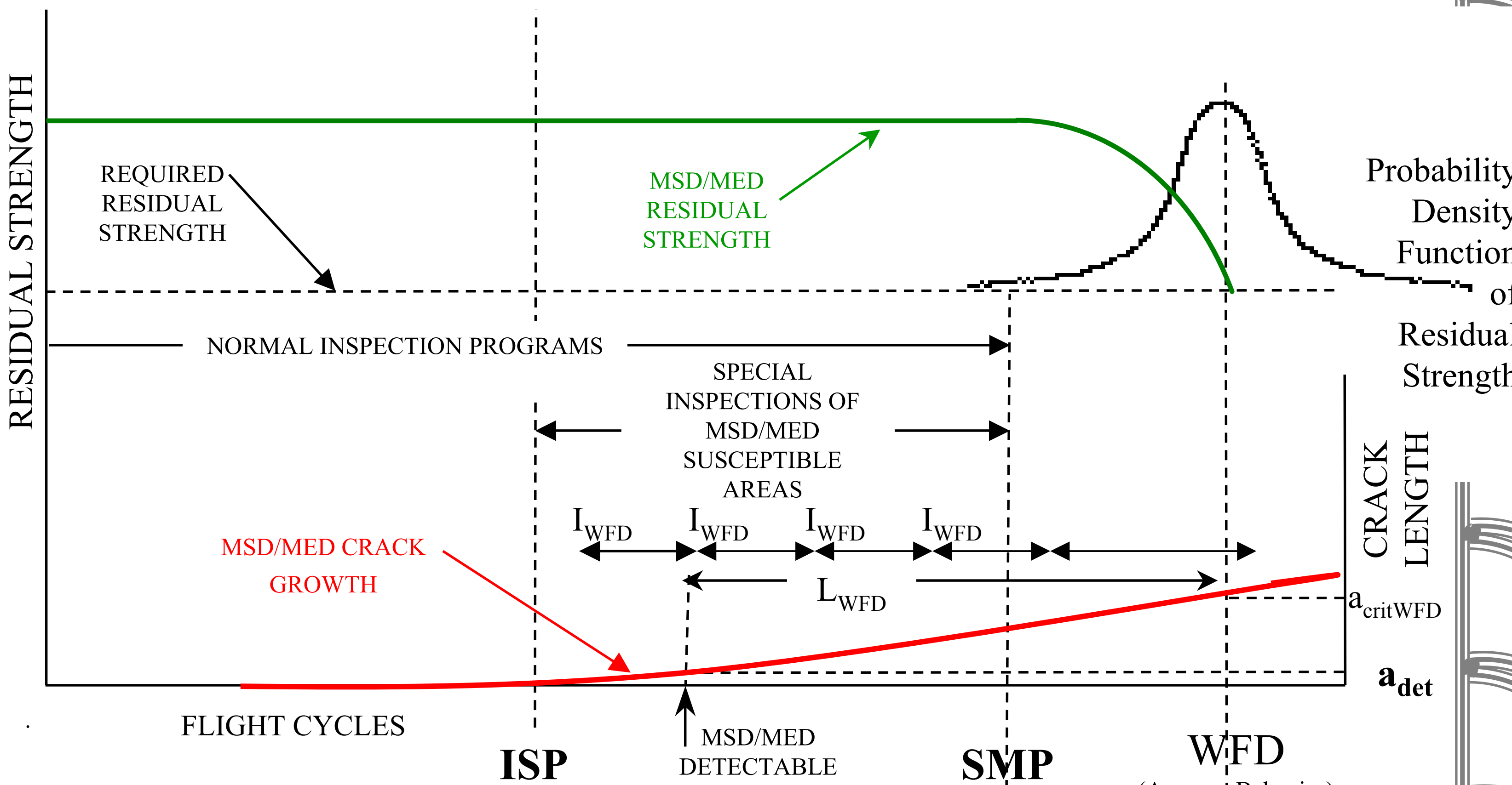
    No airplane may operate beyond SMP without modification or part replacement.

ISP and SMP

Continued

- **Task 3 - Evaluation of Maintenance Actions**
  - For all areas that have been identified as susceptible to MSD/MED, the current structural maintenance program should be reviewed to determine if it includes adequate structural maintenance and inspection provisions to safeguard the structure against unanticipated cracking or other structural degradation.
  - The following actions should be accomplished during the review:
    - From the WFD evaluation, an SMP is calculated for each area. (The SMP--flight cycles or flight hours--is the point when the structure should be modified or replaced to ensure that the threat from WFD to that structure is minimized.)
    - The calculated SMP is compared to the current structural maintenance program.

ISP and SMP Determination



Reduction to provide equivalent
Protection to a 2-Lifetime fatigue test

ISP and SMP

Continued

- For susceptible areas approaching the SMP, where the SMP will not be increased, or for areas that cannot be reliably inspected, a program should be developed and documented that provides for replacement or modification of the susceptible structural area.
- For each area where it is not imminent that the SMP will be reached and that can be reliably inspected, the following actions should be accomplished:
  - Determine the inspection requirements (method, reliability, inspection start point, and repeat interval) for each susceptible area (including that structure that is expected to arrest cracks) that is necessary to maintain the required level of safety.
  - Review the elements of the existing maintenance programs already in place.
  - Revise and highlight elements of the maintenance program necessary to maintain safety.

Federal Register

Tuesday,

April 18, 2006

Part II

Department of Transportation

Federal Aviation Administration

14 CFR Parts 25, 121, and 129

Aging Aircraft Program: Widespread Fatigue Damage; Proposed Rule

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 25, 121, and 129

[Docket No. FAA–2006–24281; Notice No. 06–04]

RIN 2120–AIO5

Aging Aircraft Program: Widespread Fatigue Damage

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed rulemaking.

SUMMARY: This action is intended to prevent widespread fatigue damage by proposing to require that design approval holders establish operational limits on transport category airplanes. Design approval holders would also be required to determine if maintenance actions are needed to prevent widespread fatigue damage before an airplane reaches its operational limit. Operators of any affected airplane would be required to incorporate the operational limit and any necessary service information into their maintenance programs. Operation of an affected airplane beyond the operational limit would be prohibited, unless an operator has incorporated an extended operational limit and any necessary service information into its maintenance program.

DATES: Send your comments on or before July 17, 2006.

ADDRESSES: You may send comments [identified by Docket Number FAA–2006–24281] using any of the following methods:

- DOT Docket Web site: Go to *http://dms.dot.gov* and follow the instructions for sending your comments electronically.
- Government-wide rulemaking Web site: Go to *http://www.regulations.gov* and follow the instructions for sending your comments electronically.
- Mail: Docket Management Facility; U.S. Department of Transportation, 400 Seventh Street, SW., Nassif Building, Room PL–401, Washington, DC 20590–0001. Due to the suspension of paper mail delivery to DOT headquarters facilities, we encourage commenters to send their comments electronically.
- Fax: 1–202–493–2251.
- Hand Delivery: Room PL–401 on the plaza level of the Nassif Building, 400 Seventh Street, SW., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

For more information on the rulemaking process, see the **SUPPLEMENTARY INFORMATION** section of this document.

Privacy: We will post all comments we receive, without change, to *http://dms.dot.gov,* including any personal information you provide. For more information, see the Privacy Act discussion in the **SUPPLEMENTARY INFORMATION** section of this document.

Docket: To read background documents or comments received, go to *http://dms.dot.gov* at any time or to Room PL–401 on the plaza level of the Nassif Building, 400 Seventh Street, SW., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: Walter Sippel, FAA, Transport Airplane Airframe/Cabin Safety Branch, ANM–115, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue, SW., Renton, WA 98039–4056; telephone (425) 227–2774, fax (425) 227–1232.

SUPPLEMENTARY INFORMATION:

Comments Invited

The FAA invites interested persons to participate in this rulemaking by submitting written comments, data, or views. We also invite comments relating to the economic, environmental, energy, or federalism impacts that might result from adopting the proposals in this document. The most helpful comments reference a specific portion of the proposal, explain the reason for any recommended change, and include supporting data. We ask that you send us two copies of written comments.

We will file in the docket all comments we receive, as well as a report summarizing each substantive public contact with FAA personnel concerning this proposed rulemaking. The docket is available for public inspection before and after the comment closing date. If you wish to review the docket in person, go to the address in the **ADDRESSES** section of this preamble between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. You may also review the docket using the Internet at the web address in the **ADDRESSES** section.

Privacy Act: Using the search function of our docket Web site, anyone can find and read the comments received into any of our dockets, including the name of the individual sending the comment (or signing the comment on behalf of an association, business, labor union, etc.). You may review DOT's complete Privacy Act statement in the **Federal Register** published on April 11, 2000 (65 FR 19477–78) or you may visit *http://dms.dot.gov.*

Before acting on this proposal, we will consider all comments we receive on or before the closing date for comments. We will consider comments filed late if it is possible to do so without incurring expense or delay. We may change this proposal in light of the comments we receive.

If you want the FAA to acknowledge receipt of your comments on this proposal, include with your comments a preaddressed, stamped postcard on which the docket number appears. We will stamp the date on the postcard and mail it to you.

Availability of Rulemaking Documents

You can get an electronic copy using the Internet by:

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

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

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

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

I. Executive Summary

The rule proposed today would establish operational limits for transport category airplanes to preclude widespread fatigue damage (WFD). It would also require actions to prevent WFD in repairs, alterations, and modifications [1] to these airplanes. This proposal should preclude WFD from occurring in transport category airplanes by providing a more proactive management of WFD.

This proposal would require type certificate (TC) holders to establish an initial operational limit on certain airplanes. Operation of these airplanes beyond the initial operational limit would be prohibited, unless operators have incorporated an extended operational limit into their maintenance programs. Type certificate holders would be required to develop the initial

[1] Throughout this proposal, reference is made to ''alterations'' and ''modifications.'' We consider these terms to be synonymous. An ''alteration'' is a design change that is made to an airplane; however, various segments of industry have also defined these changes as ''modifications.'' Therefore, we use both terms in the proposed rule to be all inclusive of any design change and to avoid potential misinterpretation of the intent of these terms.

operational limits based on an evaluation of WFD susceptibility, both for existing airplanes and for proposed future certifications. For future type certification, all TC applicants for transport category airplanes would be affected. For existing type certificates, this proposal would affect only airplanes with maximum takeoff gross weights (MTGW) over 75,000 pounds, including airplanes that have had the MTGW increased to greater than 75,000 pounds. (These airplanes are referred to in this document as large transport category airplanes.) Supplemental type certificate (STC) holders for these airplanes would be required to evaluate their STCs for WFD and the ability of the airplane to remain free of WFD up to the initial operational limit established by the TC holder.

Once the proposed initial operational limits are developed, then operational rules in parts 121 and 129 would require operators to incorporate initial operational limits into their maintenance programs. The proposed operational rules would prohibit operation beyond the limit established for an airplane. However, the proposed design approval holder and operational rules would provide means for any person to extend the initial operational limit and for operators to operate an airplane under the extended operational limit. If an extended operational limit is incorporated, the proposed operational rules would prohibit operation beyond the extended operational limit established for an airplane. In addition, the proposed operational rules would address repairs, alterations, and modifications to airplanes operating with an extended operational limit.

The present value benefits of this proposal consist of $726 million of accident prevention benefits and $83 million of detection benefits for total benefits of $809 million. The detection benefits are the benefits resulting from averted accidents and a reduction in unscheduled maintenance and repairs. The present value cost of this proposal, estimated over 20 years, is $360 million. The FAA estimates that airplane manufacturers would incur approximately 10 percent of these costs, while the remaining 90 percent of these costs would be borne by operators.

II. Background

A. Widespread Fatigue Damage

WFD is the simultaneous presence of cracks at multiple structural locations that are of sufficient size and density such that the structure will no longer meet the residual strength requirements of section 25.571(b). Fatigue damage is the gradual deterioration of a material subjected to repeated loads. Airplane structure experiences fatigue damage because it is subjected to repeated loads, such as the pressurization and depressurization of an airplane that occurs with each flight. The fatigue damage could result in cracks occurring in structure over time.

The likelihood of WFD in airplane structure increases with use. WFD results from many cracks that are generally too small to be reliably detected using existing inspection methods. These cracks could grow together very rapidly, so that failure could occur before another inspection is performed to detect them. The simultaneous presence of fatigue cracks that may grow together, with or without other damage in the same structural element, such as a large skin panel, is known as multiple site damage. The simultaneous presence of fatigue cracks in similar adjacent structural elements, such as frames and stringers, is known as multiple element damage. Some structural elements can be susceptible to both types of damage, which potentially could occur at the same time. If undetected, either type of damage could lead to catastrophic failure due to reduction of the strength capability of the structure.

The FAA, the European Joint Aviation Authorities, and representatives of the Airworthiness Assurance Working Group, working under the support of the Aviation Rulemaking Advisory Committee (ARAC), reviewed available service difficulty reports for the transport airplane fleet. They also evaluated the certification and design practices applied to these previously certificated airplanes, including fatigue test results. The review revealed that all airplanes in the fleet are susceptible to multiple site damage or multiple element damage. Table 1 identifies examples of structures susceptible to multiple site damage (MSD) and multiple element damage (MED).

TABLE 1.—EXAMPLES OF STRUCTURES SUSCEPTIBLE TO WIDESPREAD FATIGUE DAMAGE

Structure	Susceptible to
Longitudinal skin joints, frames and tear straps.	MSD/MED
Circumferential joints and stringers.	MSD/MED
Fuselage frames	MED
Lap joints with milled, chem.-milled, or bonded radius.	MSD
Stringer-to-frame attachments	MED
Shear clip end fasteners on shear tied fuselage.	MSD/MED
Aft pressure dome outer ring and dome web splices.	MSD/MED
Skin splice at aft pressure bulkhead.	MSD
Abrupt changes in web or skin thickness (pressurized or unpressurized structure).	MSD/MED
Window surround structure	MSD/MED
Overwing fuselage attachments.	MED
Latches and hinges of nonplug doors.	MSD/MED
Skin at runout of large doubler (MSD), fuselage, wing, or empennage.	MSD
Rib to skin attachments	MSD/MED
Typical wing or empennage structure.	MSD/MED
Wing and empennage chordwise splices.	MSD/MED

B. History of WFD in Transport Category Airplanes

In April 1988, an 18-foot section of the upper fuselage of an Aloha Airlines Boeing Model 737 airplane separated from the airplane en route from Hilo to Honolulu, Hawaii. The National Transportation Safety Board determined that, among other things, WFD was a contributing cause of this accident. Since then, WFD appears to have played a role in several safety incidents involving large transport airplanes, although there has not been a catastrophic accident directly attributable to WFD. In particular, the FAA has issued or is in the process of issuing Airworthiness Directives (ADs) addressing aft pressure bulkhead cracks, lap splice cracks, and frame cracks.

C. Industry Input/Aviation Rulemaking Advisory Committee

The FAA has tasked the ARAC to address several issues related to widespread fatigue damage. In 2001, the ARAC recommended imposing a limit on the validity of maintenance programs, requiring an evaluation of repairs, alterations and modifications, and providing a means of extending the limit of validity of the maintenance program for large transport category airplanes. The ARAC also recommended that elements of the existing aging airplane program be included or referenced in the Airworthiness Limitations section (ALS) of the Instructions for Continued Airworthiness (ICA). In 2003, the ARAC recommended imposing a limit on the validity of maintenance programs for all newly certificated transport category airplanes.

The ARAC recognized that structural fatigue characteristics of airplanes are only understood up to a point in time consistent with the analyses performed and the amount of testing accomplished. The maintenance program inspections related to structural fatigue are based on the results of these analyses and tests. Therefore, these inspections may need to be supplemented by further inspections, modifications, or replacements, if operation beyond a certain point is planned. The ARAC recommended that there should be a ''limit of validity of the maintenance program'' to limit the operation of an airplane. Once an airplane reached this limit, the operator should no longer operate the airplane, unless the operator has incorporated an extended limit of validity and any necessary service information into its maintenance program.

D. Current Regulations and Programs Related to WFD

1. Existing Design Criteria

In the design process, a type certificate applicant generally establishes an expected economic life for the airplane, known as a design service goal. Applicants traditionally defined the design service goal early in the development of a new airplane, based on economic analyses, past service experience with prior models, and in some cases fatigue testing. Design approval holders have also performed additional fatigue tests, teardown inspections, and analyses to support changing design service goals to extended service goals. The regulations required applicants and design approval holders only to show that individual fatigue cracks would not lead to catastrophic structural failure. Since 1978, 14 CFR 25.571 has required applicants for new type certificates for transport category airplanes to establish inspections to detect fatigue cracks before they can grow to the point of catastrophic failure (43 FR 46242, October 5, 1978). These inspections are documented in the ALS.

In 1998, the FAA amended the aircraft certification requirements for transport category airplanes (63 FR 15707, March 31, 1998). As part of the certification process, section 25.571 now requires full-scale fatigue test evidence to demonstrate that WFD will not occur before an airplane reaches its design service goal. Only a few airplane models are subject to this new requirement, because the applications for most type certificates predate 1998. Even with the requirement to perform full-scale fatigue testing, there is no requirement to limit the operation of an airplane once it reaches the design service goal.

2. Instructions for Continued Airworthiness

As part of the current certification process, TC holders and STC holders who applied for a certificate after January 28, 1981 are required by § 21.50 to make available at least one set of complete ICA to the owner of the airplane. The ICA must include inspection and replacement instructions for airplane structure. Also, any person who makes a design change to airplane structure must provide the airplane owner with a complete set of the ICA for that change.

In developing the ICA, the applicant is required to include certain information, such as a description of the airplane and its systems, servicing information, and maintenance instructions (§ 25.1529). The applicant must include the frequency and extent of the structural inspections necessary to provide for the continued airworthiness of the airplane as well as an FAA-approved ALS listing all mandatory inspections, inspection intervals, replacement times, and related procedures. The FAA requires operators to comply with each ALS established under § 25.1529 for newly certified airplanes or with operation specifications approved under part 121 or 135. Operators may also incorporate tasks—from a Maintenance Review Board document that has been approved by the FAA [2]—into their maintenance program.

3. Airworthiness Directives

The FAA currently issues ADs when we find that an unsafe condition exists in a product and the condition is likely to exist or develop in other products of the same type design. Because WFD could lead to a catastrophic failure due to reduction of the strength capability of the structure, we would issue an AD to address a finding of WFD in a particular product. An AD typically addresses an unsafe condition by requiring inspection, modification, or replacement of certain structure, or a combination of these approaches. ADs are reactive and address only known instances of WFD. Additionally, ADs are directed towards a specific group of airplanes. Hence, WFD may go undetected in other airplanes with similar structures.

4. Aging Aircraft Program

In October 1991, Congress enacted the Aging Aircraft Safety Act of 1991 (49 U.S.C. 44717) to address aging aircraft concerns. In response to the Act, the FAA published an interim final rule that amended §§ 121.368, 121.370a, 129.16, and 129.33 of the air carrier operating rules (67 FR 72726, December 6, 2002). Sections 121.368 and 129.33 require mandatory records reviews and airplane inspections after the airplane has been in service 14 years. In addition, §§ 121.370a and 129.16 require damage-tolerance-based inspections and procedures on airplanes operated under 14 CFR parts 121 and 129, respectively.

In response to the Aloha Airlines accident, the FAA formed the Airworthiness Assurance Task Force to investigate and propose solutions to the problems evidenced as a result of the accident. The task force was comprised of operators, manufacturers, and regulatory authorities. The task force recommended establishment of an Aging Airplane Program. Under the Aging Airplane Program, the FAA has mandated the following four separate programs:

- Supplemental Structural Inspection Programs for certain large transport category airplanes;
- Corrosion Prevention and Control Programs for certain large transport category airplanes;
- Repair Assessment Program to ensure existing and future repairs to the fuselage pressure boundary are assessed for damage tolerance.
- Mandatory Modification Program, based on the premise that to ensure the structural integrity of older airplanes there should be less reliance on repetitive inspections. (The determination of whether a modification is required is based on meeting certain criteria.)

These four programs or their equivalent make up the current structural maintenance program that operators incorporate into their maintenance or inspection programs to address aging structures. However, none of the programs address widespread fatigue damage.

[2] The FAA establishes a Maintenance Review Board comprised of subject matter experts who oversee development of a maintenance program for a specific airplane. In conjunction with the work of the review board, an industry steering committee comprised of representatives from the applicant, operators, and the FAA, analyzes maintenance requirements for that specific airplane. The review board and the steering committee then produce a Maintenance Review Board document that contains, among other task, inspections of the airplane structure. These inspections, in conjunction with any airworthiness limitation items established under § 25.271, address accidental damage environmental damage, and fatigue damage.

5. Advisory Circulars

We have considered issuing Advisory Circulars (ACs) to give guidance on the changes needed to prevent WFD. Advisory Circulars, however, depend on voluntary compliance and are not enforceable. Therefore, use of ACs alone would ensure neither consistent results nor achievement of the WFD safety objectives for the current and future fleet.[3]

E. Summary of the Proposal

Long-term reliance on existing requirements, even those that incorporate the latest mandatory changes introduced to combat structural degradation due to WFD, creates a risk of structural failure and related accidents because the requirements are inadequate to preclude WFD.

To address WFD, we need a proactive approach, i.e., address conditions affecting safe flight that we know can happen—before they happen. This approach would require persons to analyze the causes of WFD in relation to the entire airplane and to analyze repairs, alterations, and modifications installed on the airplane.

Based on the ARAC recommendations[4] and our own analysis, we have determined that operators, TC holders, and STC holders need to place more emphasis on WFD. This proposal is designed to heighten the awareness of the threat of WFD to airplanes and to change the current approach to maintaining and modifying them. Table 2 summarizes the proposed regulatory changes discussed today.

TABLE 2.—SUMMARY OF PROPOSED REGULATORY CHANGES ADDRESSING WFD

14 CFR	Description of proposal	Applies to	Compliance date
§ 25.571	Replace "design service goal" with "initial operational limit."	Future applicants for new Type Certificates (TC).	Before approval of TC by Aircraft Certification Office (ACO).
	Require an initial operational limit as part of the Airworthiness Limitation Section (ALS) of the Instructions for Continued Airworthiness (ICA).		
§ 25.1807	Require initial operational limits for all transport category airplanes with a Maximum Takeoff Gross Weight (MTGW) greater 75,000 lb.	TC holders	December 18, 2007.
		Supplemental TC (STC) holders*	December 18, 2007.
		Applicants for pending TCs and STCs.*	Later of December 18, 2007, or date of certificate.
		Applicants for new STCs* and amended TCs.*	Later of December 18, 2007, or date of certificate.
	Establish WFD guidelines for assessing repairs, alterations, and modifications.	TC holders	December 18, 2009.
		Applicants for TCs	Later of December 18, 2009, or date of certificate.
§ 25.1809	Require WFD assessment of all existing, pending, and future structural design changes in relationship to initial operational limits; require development of any maintenance actions to preclude WFD.	STC holders (other than those covered by § 25.1807).	December 18, 2010.
		Applicants for pending and future STCs and amended TCs.	Later of December 18, 2010, or date of certificate.
§ 25.1811	Establish requirements for extending any operational limits.	Any person	Before approval of extension by ACO.
§ 25.1813	Establish requirements for evaluating certain repairs, alterations, and modifications proposed for installation on airplanes with an extended operational limit.	Any person seeking approval for repairs, alterations, or modifications.	Before approval of repairs, alterations, or modifications by ACO.
Appendix H to part 25	Require initial operational limits as part of the ALS of the ICA.	Applicants for future TCs	Before approval of TC by ACO.
	Require guidelines for evaluating WFD effects of repairs, alterations, and modifications.		
§ 121.1115 § 129.115	Require operators to incorporate operational limits into their maintenance programs.	U.S. certificate holders and foreign persons operating U.S.-registered transport category airplanes.	June 18, 2008.
	Require operators to incorporate any WFD airworthiness limitations for airplanes with extended operational limits.	....	Before operating under extended operational limit.

[3] Voluntary safety assessments, such as those relating to the thrust reverser and cargo door reviews, have been difficult to complete in a timely manner because they lacked enforceability.

[4] "Structural Fatigue Evaluation for Aging Airplanes" (October, 1993); recommendation to add an appendix to AC 91–56, "Supplemental Structural Inspection Program (SSIP) for Large Transport Category Airplanes"; "Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Fleet" Rev. A (June, 1999); "General Structures Harmonization Working Group Report Damage Tolerance and Fatigue Evaluation of Structures FAR/JAR § 25.571" (October, 2003).

TABLE 2.—SUMMARY OF PROPOSED REGULATORY CHANGES ADDRESSING WFD—Continued

14 CFR	Description of proposal	Applies to	Compliance date
	Establish requirements for identification and evaluation of certain repairs, alterations, and modifications installed on airplanes operating under an extended operational limit.	....	Within 90 days after return to service, following repairs, alterations, or modifications.

* Where STC increases MTGW to greater than 75,000 lb.

Note. There are also requirements for current holders of design approvals and those with pending design approvals to develop compliance plans, detailing how they will achieve compliance with the applicable requirements. For future applicants, similar information would be contained in a certification plan. To simplify the table above, these administrative requirements were omitted.

III. Requirements for Design Approval Holders

A. Ongoing Responsibility of Type Certificate Holders for Continued Airworthiness

Several recent safety regulations necessitated action by air carriers and other operators but did not require design approval holders to develop and provide the necessary data and documents to facilitate the operators' compliance. Operators are often dependent on action by a design approval holder before they can implement new safety rules. Ongoing difficulty reported by operators in attempting to meet these rules has convinced us that corresponding design approval holder (DAH) responsibilities may be warranted under certain circumstances to enable operators to meet regulatory deadlines. When DAHs fail to provide the required data in a timely manner, operators may be forced to incur the costs associated with obtaining the expertise to develop the data. Some examples of programs in which some DAHs did not develop and make available the necessary information in a timely manner include:

- Thrust reversers, where it took 10 years to develop some service information AD-related items;
- Class D to Class C Cargo Conversions, where one TC holder did not develop the necessary modifications in time to support operator compliance and where several operators were unable to obtain timely technical support and modification parts from STC holders;
- The Reinforced Flight Deck Door Program, where most operators had substantially less than the one-year compliance time originally anticipated because of delays in developing and certifying the new designs;
- Repair Assessment Rule, where some operators were required to develop their own data for FAA approval in order to meet the rule's compliance date; and
- Structural Repair Manuals, where operators are still awaiting DAH action to perform damage tolerance evaluations and establish inspections, even though the DAH committed to completing this activity by 1993.

In addition, DAHs have committed in the past to providing data to the FAA to support the certification basis of an airplane. In some instances, the DAH has missed the due date given for this commitment by up to 13 years.

We intend to require type-certificate holders, manufacturers and others to take actions necessary to support the continued airworthiness of and to improve the safety of transport category airplanes. Such actions include performing assessments, developing design changes, revising ICAs, and making available necessary documentation to affected persons. We believe this requirement is necessary to facilitate compliance by air carriers with operating rules that in effect demand the use of new safety features.

To address this problem, we propose to amend subpart A of part 25 to expand its coverage and to add a new subpart I to establish requirements for current holders. As discussed in our final rule, ''Fuel Tank Safety Compliance Extension and Aging Airplane Program Update'' (69 FR 45936, July 30, 2004), this and related proposals would add provisions to a new subpart I requiring actions by design approval holders that will allow operators to comply with our rules.

Part 25 currently sets airworthiness standards for the issuance of TCs and changes to those certificates for transport category airplanes. It does not list the specific responsibilities of manufacturers to ensure continued airworthiness of these airplanes once the certificate is issued. Therefore, we propose to revise § 25.1 by adding paragraph (c) to make clear that part 25 creates such responsibilities for holders of existing type and supplemental type certificates for transport category airplanes and applicants for approval of design changes to those certificates. Paragraph (d) would be added to make part 25 applicable to persons seeking approval of repairs, alterations, or modifications of certain transport category airplanes. This latter category is included, because repairs, alterations, and modifications can affect the structural integrity of the airplane. These changes may have an adverse effect on the continued airworthiness of the airplane. Those seeking approval of these changes should be aware of these effects and address these issues if relevant.

In order to ensure the effectiveness of this change, we would also amend § 25.2(d) (''Special retroactive requirements'') so as to require adherence to a new Subpart I which may require design changes and other activities by manufacturers when needed. The amended paragraph would also apply to persons seeking approval of repairs, alterations or modifications of transport category airplanes. This latter category is included because repairs, alterations and modifications can affect the structural integrity of the airplane. If the repairs, modifications or alterations are performed incorrectly, they may have an adverse effect on the continued airworthiness of the airplane.

This proposal would establish a new subpart I, Continued Airworthiness and Safety Improvements, where we would locate rules imposing ongoing responsibilities on design approval holders. On July 12, 2005, we issued policy statement PS–ANM110–7–12–2005, ''Safety—A Shared Responsibility—New Direction for Addressing Airworthiness Issues for Transport Airplanes'' (70 FR 40166). The policy states, in part, ''Based on our evaluation of more effective regulatory approaches for certain types of safety initiatives and the comments received from the Aging Airplane Program Update (July 30, 2004), the FAA has concluded that we need to adopt a regulatory approach recognizing the shared responsibility between design approval holders (DAHs) and operators. When we decide that general rulemaking is needed to address an airworthiness issue, and believe the safety objective can only be fully achieved if the DAHs provide operators with the necessary information in a timely manner, we will propose requirements for the affected DAHs to provide that information by a certain date.''

We believe that the safety objectives contained in this proposal can only be reliably achieved and acceptable to the FAA if the DAHs provide the operators with the initial operational limits required by the proposed operational rules for parts 121 and 129. Our determination that DAH requirements are necessary to support the initiatives contained in this proposal is based on several factors:

- Developing initial operational limits is complex. Only the airplane manufacturer, or DAH, has access to all the necessary type design data needed for the timely and efficient development of the required initial operational limit.
- FAA-approved operational limits need to be available in a timely manner. Due to the complexity of these initial operational limits, we need to ensure that the DAHs submit them for approval on schedule. This will allow the FAA Oversight Office having approval authority to ensure that the initial operational limits are acceptable, are available on time, and can be readily implemented by the affected operators.
- The proposals in this NPRM affect a large number of different types of transport airplanes. Because the safety issues addressed by this proposal are common to many airplanes, we need to ensure that technical requirements are met consistently and the processes of compliance are consistent. This will ensure that the proposed safety enhancements are implemented in a standardized manner.
- The safety objectives of this proposal need to be maintained for the operational life of the airplane. We need to ensure that future design changes to the type design of the airplane do not degrade the safety enhancements achieved by the incorporation of initial operational limits. We need to be aware of future changes to the type designs to ensure that these changes do not invalidate initial operational limits developed under the requirements of this proposal.

Based on the above reasons and the stated safety objectives of FAA policy PS–ANM110–7–12–2005, we are proposing to implement DAH requirements applicable to operational limits.

In the past, this type of requirement took the form of a Special Federal Aviation Regulations (SFAR). These regulations are difficult to locate because they are scattered throughout Title 14. Placing all these types of requirements in a single subpart of part 25 which contains the airworthiness standards for transport category airplanes would provide ready access to critical rules.

In preliminary discussions with foreign aviation authorities with whom we try to harmonize our safety rules, they have expressed concern about consolidating parallel requirements in their counterparts to part 25. They have suggested that it may be more appropriate to place them in part 21 or elsewhere. Therefore, we specifically request comments from the public, including foreign authorities, on the appropriate place for these airworthiness requirements for type certificate holders.

We reserve additional sections in this proposed subpart to include other future aging airplane rules, several of which are under development. Some of these proposals include similar language establishing the general airworthiness responsibilities of manufacturers and thus include some overlapping provisions. Once any proposal establishing these broad responsibilities becomes a final rule, we will delete the duplicative requirements from the other proposals and retain only that language pertinent to any specific new safety regulations (such as fuel-tank flammability reduction).

However, the ongoing-airworthiness requirements in Subpart I would not by their terms reach applicants for TCs with respect to new projects for which application is made after the effective date of the proposed rule. This is unnecessary, because when we adopt a new requirement for TC holders, there will be a corresponding amendment to part 25 expressly making the new, or a similar safety standard a condition for receiving a TC in the future. For example, in this proposal, the new requirements of § 25.571 regarding WFD will govern future applications.

For safety reasons, however, we are requiring that any application for a type design change not degrade the level of safety already created by the TC holder's presumed compliance with the subpart I rule. Currently, when reviewing an application for such a change, we employ the governing standards stated in part 21, specifically § 21.101. That section generally requires compliance with standards in effect on the date of application but contains exceptions that may allow applicants to show compliance with earlier standards. For example, if a change is not considered ''significant,'' the applicant may be allowed to show compliance by pointing to standards that applied to the original TC. (See AC 21.101–1, ''Establishing the Certification Basis of Changed Aeronautical Products,'' a copy of which can be downloaded from *http://www.airweb.faa.gov/rgl*).

With the adoption of subpart I rules, we must ensure that safety improvements that result from TC holder compliance with these requirements are not undone by later modifications. Therefore, even when we determine under § 21.101 that applicants need not comply with the latest airworthiness standards, they will be required to demonstrate that the change would not degrade the level of safety provided by the TC holder's compliance with the subpart I rule. In the context of this proposal, for example, this will mean that an applicant for approval of a design change would have to perform a WFD evaluation to determine if any maintenance actions are necessary to preclude WFD.

B. Applicability

1. Holders of Type Certificates and Supplemental Type Certificates

This proposal, if adopted, would impose requirements on TC holders for all large transport category airplanes. Under § 25.571, an applicant for a TC would have to establish an initial operational limit for the contemplated airplane design as part of its application. Likewise, existing TC holders would have to establish an initial operational limit for all large transport category airplanes under § 25.1807 if the MTGW of the airplane exceeds 75,000 lb. Type certificate and STC holders would also have to establish an initial operational limit for all large transport category airplanes under § 25.1807 if the MTGW of the airplane was 75,000 pounds or less, and later increased to greater than 75,000 pounds by an amended type certificate or supplemental type certificate.

This proposal, if adopted, would apply not only to domestic TC and STC holders, but also to foreign TC and STC holders. This rule would be different from most type certification programs for new TCs, where foreign applicants typically work with their responsible certification authority and the FAA relies to some degree upon that authority's findings of compliance under bilateral airworthiness agreements. Presently no other certification authority has adopted requirements addressing WFD for existing TCs. Additionally, while some authorities have indicated an interest in adopting some type of requirements for new airplane designs, they may not adopt requirements applicable to existing TCs.

Accordingly, the FAA will retain the authority to make all the necessary compliance determinations and, where appropriate, may request certain compliance determinations by the appropriate foreign authorities using procedures developed under the bilateral agreements. The compliance planning provisions of this proposed rule are equally important for domestic and foreign TC and STC holders and applicants, and we will work with the foreign authorities to ensure that their TC and STC holders and applicants perform the planning necessary to comply with those requirements.

2. Airplanes

If adopted, this rule would apply, with some exceptions discussed below, to large transport category airplane designs (MTGW greater than 75,000 pounds) by virtue of either the original certification of the airplane or a later increase in its MTGW. All transport category airplanes certificated under a TC that was applied for after the effective date of the final rule would also be subject to the requirements proposed today. This combined approach would result in the coverage of airplanes where the safety benefits and the public interest are the greatest.

The ARAC working group that developed this recommendation did not include design approval holders for airplanes of less than 75,000 pounds MTGW, in part because they were not asked to do so. However, in addition to its WFD recommendations, this working group developed recommendations on other aging airplane issues, including the Supplemental Structural Inspection Program, the Corrosion Prevention and Control Program, the Repair Assessment Program, and the Mandatory Modification Program. Because of these efforts, design approval holders for large transport category airplanes have already developed the technology and the internal organizational capability to address WFD. Therefore, the 75,000 pound MTGW is a logical reference point for developing programs for addressing WFD.

We considered applying this proposal to all existing part 25 airplanes. However, we have determined that smaller regional jets do not currently present a risk of WFD sufficient to justify the cost associated with meeting this proposal.

The 75,000-pound cutoff excludes about 1,600 regional jets that are operating under parts 121 and 129 today. Of those airplanes, there are approximately 430 regional jets that are at least eight years old. These airplanes have accumulated an average of 12,000 flight cycles. The regional jet with the greatest number of flight cycles is 11 years old and has accumulated about 26,000 flight cycles, well below the existing design service goal for this airplane of 60,000 flight cycles.

The FAA recognizes that using a cutoff of 75,000 pounds does not align with the FAA's ''One Level of Safety'' initiative (that is, the same level for all airplanes used in air carrier service). However, we determined a cutoff of 75,000 pounds to be appropriate at this time for the following reasons:

- This is the same cutoff used for the four aging airplane programs mentioned above, and the affected type certificate holders are able to address these problems now.
- Some airplanes over 75,000 pounds are at a greater risk due to higher total cycles and age.
- Most air carrier airplanes are of this size, and many of them are near or over their design service goal.
- The regional jets not affected are relatively young and, therefore, at low risk relative to WFD.
- The high-cycle regional jet will be in service for an additional 14 years before reaching its design service goal.

The FAA may determine that we need to expand the scope of this rule at a later time, based on evaluations of the potential for WFD in regional jets. All of these regional jets are manufactured in other countries, and any efforts to address WFD should be developed in coordination with those countries. Until that time, if WFD problems are identified in these airplanes, we will address them through airworthiness directives. No WFD problems have yet been identified for regional jets. The FAA requests comments on this aspect of the proposed rule.

While the ARAC recommendations applied to all transport category airplanes over 75,000 pounds, the group of airplanes of most concern is that group operating under parts 121 and 129. Because carriers in scheduled operations fly airplanes operated under those parts, they are flown more often than other airplanes of comparable size and are accordingly more likely to develop WFD. Thus, this proposal would exclude airplanes over 75,000 pounds that are not operated under parts 121 or 129. For this reason, we have tentatively decided that this proposal, if adopted, should exclude the Bombardier BD–700, the Gulfstream G–V, the Gulfstream G–VSP, and the British Aerospace, Aircraft Group and Societe Nationale Industrielle Aerospatiale Concorde Type 1.

It is not clear at this time that the possible benefits of this rule for those airplanes would be proportionate to the cost involved. We request comments on the feasibility and benefits of including or excluding these airplanes. We also request comments on the feasibility of including or excluding any other transport category airplanes with a maximum takeoff gross weight greater than 75,000 pounds from the requirements of this provision, whether or not they are operated under parts 121 and 129.

C. Initial Operational Limit (§ 25.571, § 25.1807)

Under this proposal, design approval holders would be required to establish an initial operational limit [5] for all transport airplanes if certificated under a new TC and for those transport airplanes over 75,000 pounds if certificated under an existing TC. Demonstration that WFD will not occur prior to the initial operational limit typically would involve an evaluation of the airplane model using fatigue test evidence, analyses, and airplane service information. Initial operational limits may also include specified maintenance actions necessary to preclude WFD, which would be addressed through the airworthiness directive process.[6]

Airplane owners or operators may need to take certain maintenance actions to support the operational limits. These actions may include additional inspections, structural modifications, or replacements. The inspections would include an inspection start point and repetitive inspection intervals, along with inspection methods. Because inspections may not be reliable in detecting MSD or MED, structural modification points, which may include modifications or replacements, may eventually be required. Means of compliance with the requirements for performing a WFD evaluation and establishing an inspection start point and structural modification points will be further described in a proposed AC.

To establish an initial operational limit, the FAA recognizes that the structural configuration of the airplane

[5] The most direct method for limiting the operation of an airplane is to prohibit operation beyond a certain point. For the purpose of this rule, we are using the term ''operational limit of an airplane'' rather than ''limit of validity of the maintenance program'' as recommended by ARAC.

[6] We intend to use the AD process, so that operators will have an opportunity to comment on the contemplated maintenance actions.

needs to be identified. Thus, § 25.1807 would specify the airplane structural configurations that must be evaluated. As a minimum, the structural configuration would consist of all model variations and derivatives approved under the type certificate and all structural modifications and replacements mandated by ADs as of the effective date of the rule. These ADs would only be those issued against any configurations developed by TC holders. They would not be for any ADs issued against modifications defined by an STC installed on affected airplanes. The result would be an airplane structural configuration that is clearly understood by both industry and the FAA.

The initial operational limit would be stated as a number of total accumulated flight cycles or flight hours. An initial operational limit based on flight hours may be required for structure, such as the wings, that typically accumulates fatigue damage due to the repeated flight loads that occur on an airplane over time. An initial operational limit based on flight cycles may be required for structure, such as the fuselage, that typically accumulates fatigue damage due to the pressurization and depressurization of an airplane. There is no way to correlate between the two limits without knowing the applicable design and operational variables, such as average flight length. Accordingly, design approval holders may need to establish both a flight hour limit and a flight cycle limit.

The initial evaluation of the airplane structural configuration should identify a projected airplane usage beyond its design service goal (DSG). This projected airplane usage is also known as the ''proposed extended service goal'' (ESG). Typically, an evaluation through at least an additional twenty-five percent of the DSG would provide a realistic ESG. The ESG would be based on an additional evaluation of the airplane structural configuration and depends on the following:

• The projected useful life of the airplane at the time of the initial evaluation;

• Current inspection techniques and procedures; and

• Airline advance planning requirements for introduction of new maintenance actions, to support the ESG.

Design approval holders may select DSGs or ESGs as starting points for establishing initial operational limits. Service information may be available for design approval holders to make those initial operational limits higher. In fact, the FAA is aware that design approval holders may have service information, such as service bulletins or all operator letters that could have an impact on proposed initial operational limits, but have not been mandated by AD. We are also aware that these persons may be in the process of developing service information that could have an impact on proposed initial operational limits. They may choose to specify additional maintenance actions resulting from such service information that could result in higher initial operational limits.

Accordingly, the proposed rule includes an option for design approval holders to use existing maintenance actions for which service information has not been mandated by AD. These maintenance actions would be in addition to the airplane structural configurations that design approval holders would evaluate under the proposed regulation. To use this option, the affected design approval holders would be required to submit a list identifying the existing maintenance actions to the FAA oversight office. The affected design approval holders would then establish initial operational limits based on WFD evaluations that take credit for existing maintenance actions.

The proposed rule also includes an option for affected design approval holders to use maintenance actions for which service information has not been issued. Those maintenance actions would be in addition to the airplane structural configurations that must be evaluated. To use this option, the affected persons would be required to submit a list identifying each of those maintenance actions and a binding schedule for providing in a timely manner the necessary service information for those actions to the FAA oversight office. The binding schedule is necessary to ensure the applicable service information is provided to the FAA in sufficient time for the agency to issue ADs mandating these actions, and operators to comply with them before WFD occurs. The design approval holders would then establish initial operational limits based on WFD evaluations that take credit for maintenance actions for which service information has not been issued.

The WFD evaluation would consist of identifying structure susceptible to multiple site damage or multiple element damage based on the configurations discussed above. Once the structure has been identified, affected design approval holders would determine when WFD is likely to occur. This WFD evaluation would be based on consideration of the following:

• Service history: reported findings of multiple site damage or multiple element damage.

• Test data: WFD information from past component or full-scale test results. This could include information on susceptibility of structure to WFD, crack initiation life, crack growth life, and residual strength.

• Fatigue analyses: predictions of times when multiple site damage or multiple element damage cracking would occur.

• Damage tolerance analyses: predictions of multiple site damage or multiple element crack growth life and residual strength.

• Teardown inspections of high-usage airplanes.

Certain design approval holders have revealed to the FAA their plans to establish initial operational limits that would be 130 to 150 percent of the DSG or ESG for their airplanes. They have also started to identify the necessary maintenance actions, including the inspection and modification start points, to preclude WFD up to the established initial operational limits for these airplanes. Many inspection and modification start points would be approximately at the design service goal or, in some cases, at 125 percent of the design service goal. This would support an initial operational limit that could be substantially higher than the DSG or ESG for a particular airplane. Other design approval holders have indicated that the initial operational limits for their airplanes would be at DSG or ESG. This is because relatively few of their airplanes are in operation today or all of their airplanes are many years away from accumulating the number of flight cycles shown in Table 3.

Table 3 provides estimates of DSGs and ESGs of various airplanes that would be affected by this proposal. These DSGs and ESGs are based on information provided by type certificate holders or on a conservative estimate by the FAA.

TABLE 3.—DESIGN AND EXTENDED SERVICE GOALS

Airplane type	Type certificate	Service goals (in flight cycles)
Airbus:		
A300 B2–1A, B2–1C and B2K–3C	A35EU	48,000
A300 B4–2C and B4–103	A35EU	40,000
A300 Model B4–203	A35EU	34,000
A300 B4–600 Series, B4–600R Series and F4–600R Series	A35EU	30,000
A310–200 Series	A35EU	40,000
A310–300 Series	A35EU	35,000
A319 (all models)	A28NM	48,000
A320 (all models)	A28NM	48,000
A321 (all models)	A28NM	48,000
A330 (all models)	A46NM	40,000
A340 (all models)	A43NM	20,000
Boeing:		
Boeing 707 (–100 series and –200 series)	4A21	20,000
Boeing 707 (–300 series and –400 series)	4A26	20,000
Boeing 717 (all models)	A6WE	60,000
Boeing 720	4A28	30,000
Boeing 727	A3WE	60,000
Boeing 737	A16WE	75,000
Boeing 747	A20WE	20,000
Boeing 757	A2NM	50,000
Boeing 767	A1NM	50,000
Boeing 777	T00001SE	44,000
Bombardier Aerospace Model:		
CL–44D4 and CL–44J	1A20	20,000
British Aerospace Airbus, Ltd.:		
BAC 1–11 (all models)	A5EU	85,000
British Aerospace (Commercial Aircraft) Ltd.:		
Armstrong Whitworth Argosy A.W. 650 Series 101	7A9	20,000
BAE Systems (Operations) Ltd.:		
BAE 46 (all models) and Avro 146	A49EU	50,000
RJ70A, RJ85A and RJ100A (all models)		
Fokker:		
F28/F70/F100 (all models)	A20EU	90,000
Lockheed:		
300–50A01 (USAF C 141A)	A2SO	20,000
L–1011 (all models)	A23WE	36,000
L188 (all models)	A1SO	26,600
382 (all models)	4A22	20,000
1649A–98	4A17	20,000
1049–54, 1049B–55, 1049C–55, 1049D–55, 1049E–55, 1049F–55, 1049G–82	6A5	20,000
49–46, 149–46, 649–79, 649A–79, 749–79, 749A–79	A–763	20,000
McDonnell Douglas:		
DC–6	A–781	20,000
DC–6A (all models)	6A3	20,000
DC–6B (all models)	6A4	20,000
DC–7 (all models)	4A10	20,000
DC–8 (all models)	4A25	50,000
DC–9 (all models)	A6WE	100,000
DC–10–10	A22WE	42,000
DC–10–30, –40	A22WE	30,000
MD–10–10F	A22WE	42,000
MD–10–30F	A22WE	30,000
MD–11 (all models)	A22WE	20,000
MD–80 (all models)	A6WE	50,000
MD–90–30	A6WE	60,000

D. Instructions for Continued Airworthiness (§ 25.571, § 25.1807, § 25.1811, Appendix H)

We propose to require inclusion of the initial operational limit in the ALS of the ICA. This limit would be stated as a number of total accumulated flight cycles or flight hours. We will publish a notice in the **Federal Register** informing the public that the initial operational limits are available on an FAA website when this information is received from the design approval holders.

- For those persons that applied for a TC after the effective date of the rule, the ICA, which includes the ALS, would be provided with an airplane upon delivery. This ICA would also include guidelines to assist in addressing future repairs, alterations, and modifications so that they do not compromise this initial operational limit.
- For those TC holders that currently have an ALS, the ALS would be revised to include the initial operational limit. For those TC holders with airplanes that currently do not have an ALS, the ALS would be established to include the initial operational limit.
- For any person who applies for an extended operational limit, we propose to require inclusion of that limit in a supplement to the ALS. This extended operational limit may include service information documented as airworthiness limitation items that must be accomplished to support the extended operational limit.

The ALS is required by current part 25 and includes those items that have mandatory inspection or replacement times related to structure. However, the current part 25 ALS and ICA requirements apply only to airplanes certified after amendment 25–54 became effective in 1980. As a result, they are not applicable to many current airplanes.

For those TC holders with airplanes that currently do not have an ALS, the ALS would address only initial operational limits. This proposal would not require that the ALS for these airplanes include the other requirements for an ALS established under amendment 25–54 to part 25, or a later amendment.

Assuming the final rule for this proposal is effective December 18, 2006, this proposal would set a 12-month timeframe for development of the ALS, unless previously accomplished, to include initial operational limits. TC holders would be required to comply by December 18, 2007. Persons who have pending applications for TCs would be required to comply by December 18, 2007, or the date a certificate is issued, whichever occurs later. Holders or applicants for STCs, or amendments to TCs, that increase the maximum takeoff gross weight to greater than 75,000 pounds would be required to comply by December 18, 2007, or, in the case of applicants, the date a certificate is issued, whichever occurs later.

In determining the compliance schedules for the proposed requirements, we balanced the safety-related reasons for the rule against the need to give industry sufficient time to comply. Therefore, before setting the proposed compliance dates for analysis completion, we considered the following:

- Alignment with current or planned compliance dates of several aging-related rulemakings, such as the Aging Airplane Safety rule (FR cite), Fuel Tank System safety initiatives (69 FR 45936, 66 FR 23086), and Enhanced Airworthiness Program for Airplane Systems/Fuel Tank Safety (69 FR 58508, October 6, 2005).
- Safety improvements that will result from compliance with this rule.
- Industry's current efforts to incorporate some of these safety initiatives.

However, the rulemaking process took longer than originally anticipated. Consequently, given the specific compliance dates in the proposed rulemaking and the likelihood that finalization of the rules will be later than expected, there may not be as much time allowed for compliance as originally planned. We recognize that compliance intervals may need to be adjusted and will consider your comments on this condition.

E. Service Information and Guidelines for Repairs, Alterations and Modifications (§ 25.1807(g), Appendix H)

The proposal would require affected persons to submit for FAA approval WFD service information and guidelines for addressing repairs, alterations, and modifications. Operators often use manufacturers' data, such as structural repair manuals and service bulletins, to repair or modify their airplanes. Such repairs or modifications could be made at any time during the service life of the airplane. This proposal would require TC holders to evaluate repairs and modifications identified in their structural repair manuals, service bulletins, and other service information and design approvals. The evaluation of these repairs and modifications is necessary to determine if and when WFD is likely to occur. If the evaluation concludes that WFD is likely to occur before the initial operational limit, then service information for maintenance actions must be developed and submitted to the FAA oversight office for approval. Once approved, we would issue ADs that would require operators to perform the maintenance actions.

Because TC holders are the only persons with sufficient knowledge of the airplane to be able to develop the guidelines, they would also be required to develop and submit WFD guidelines for evaluating repairs, alterations, and modifications susceptible to WFD other than those for which they are responsible. The guidelines would use criteria similar to those used to evaluate the full airplane structural configurations discussed above and could include service history, fatigue analysis, test data, or damage tolerance analysis. The guidelines would provide a means to identify repairs, alterations, or modifications that may be susceptible to WFD. As discussed earlier, we have tasked ARAC to provide recommendations for methods to develop this type of guidance. We will provide guidance for development of these guidelines in a proposed AC.

We anticipate the guidelines would have the necessary data to allow others to identify and perform an evaluation of repairs, alterations, and modifications. Also, these guidelines would support identification and evaluations of STCs and repairs, alterations, and modifications to those STCs. They could be used to develop extended operational limits and evaluate repairs, alterations, and modifications for those airplanes with extended operational limits. These guidelines would contain data for development of service information that would include possible maintenance actions that, as stated earlier, may include inspection start points, structural modification points, and inspection intervals and methods.

We propose a compliance date of December 18, 2009, or the date the certificate is issued, whichever occurs later, for affected persons to submit service information and guidelines for approval by the FAA oversight office. We consider development of initial operational limits to be the most pressing concern. Accordingly, we would provide TC holders and applicants with additional time to address repairs, alterations, and modifications after the development of initial operational limits. This will enable TC holders and applicants to use the results of the ARAC tasking discussed earlier.

F. Changes to Type Certificates (STCs and Amended TCs) (§ 25.1809)

STC holders, or applicants for design changes, would be required to perform a WFD evaluation to determine if the design change, or structure affected by the design change, requires maintenance actions prior to the initial operational limit.[7] Affected structure can be new structure installed by a design change or existing structure modified by a design change. Structure may be affected if it is physically changed or there is a change or redistribution of internal loads. The following types of repairs, alterations or modifications are likely to have WFD implications:

- Passenger-to-freighter conversions (including addition of main deck cargo doors).
- Gross weight increases (increased operating weights, increased zero fuel weights, increased landing weights, and increased maximum takeoff weights).
- Installation of fuselage cutouts (passenger entry doors, emergency exit doors or crew escape hatches, fuselage access doors, and cabin window relocations).
- Complete re-engine or pylon modifications.
- Engine hush-kits and nacelle alterations.
- Wing modifications such as installing winglets or changes in flight control settings (flap droop), and alteration of wing trailing edge structure.
- Modified, repaired, or replaced skin splices.
- Any modification, repair, or alteration that affects several stringer or frame bays.
- A modification that covers structure requiring periodic inspection by the operator's maintenance program.
- A modification that results in operational mission change that significantly changes the manufacturer's load or stress spectrum, e.g., passenger-to-freighter conversion.
- A modification that changes areas of the fuselage that prevents external visual inspection, e.g., installation of a large external fuselage doubler that results in hiding details beneath it.

This proposal would require evaluation of affected structure and any additional service information to determine if the structure is susceptible to multiple site damage or multiple element damage. This evaluation would be performed using manufacturers' guidelines or guidelines approved by the FAA oversight office. Affected persons would be required to use one of the approved procedures for screening design changes for standardization purposes. The proposed requirements would impose the same level of evaluation as proposed for TC holders in determining an initial operational limit.

The guidelines would provide affected persons with a means to identify whether affected structure is susceptible to WFD. It would also provide a standardized WFD methodology for evaluating any design changes and determining their impact on surrounding structure. The guidelines would specify criteria to determine if additional maintenance actions are required. If an affected person determines that the design change does not cause a WFD concern, then no further action is required.

For future design changes, the ALS developed with the ICA would include any associated service information that is necessary to enable the airplane to reach the initial operational limit. This service information would be documented as airworthiness limitation items (ALIs). Under § 91.403(c), compliance with airworthiness limitations is mandatory, so the effect of documenting these actions as ALIs is that operators using the design change would be required to do them.

The following compliance dates for evaluating design changes and developing service information for maintenance actions that must be performed to preclude WFD would need to be met:

- Holders of STCs: no later than December 18, 2010.
- Applicants for STCs and for amendments to STCs: no later than December 18, 2010, or the date the certificate is issued, whichever occurs later.

G. Extended Operational Limit (§ 25.1811, § 25.1813)

This proposal, if adopted, would permit operation of an airplane past its existing (initial or extended) operational limit if a person were able to demonstrate that WFD will not occur in the airplane up to the proposed extended operational limit. Any person wanting to operate beyond an existing operational limit would be required to perform an evaluation to that end as part of the amended TC (subpart D of part 21) or STC (subpart E of part 21) process. The extended operational limit may also include specified maintenance actions necessary to preclude WFD, which would be part of the extended operational limit approval. Extended operational limits would be established in an ALS using the requirements of § 25.1529, along with corresponding ALIs. This proposed requirement does not specify a compliance plan since the normal process for obtaining approvals under the provisions of subparts D and E of part 21 already contemplates such a plan.

To establish an extended operational limit, the structural configuration of each affected airplane needs to be identified as follows:

- All model variations and derivatives approved under the type certificate for which extension is sought.
- Any maintenance actions identified by the TC or STC holder as necessary to support the initial operational limit established under § 25. 571 or § 25.1807.
- All structural repairs, alterations, and modifications installed on each affected airplane, whether or not required by AD, up to the date of approval of the extended operational limit.

Unlike the proposed requirements for initial operational limits, applicants might have to conduct separate evaluations on each affected airplane because of configuration differences rather than relying on a single evaluation for a group of airplanes. The configuration for any one airplane may consist of repairs, alterations, or modifications that are unique to that airplane. Applicants might also need to consider additional fatigue testing because the fatigue testing that supported the initial operational limit may not be sufficient to support the proposed extended operational limit. The service information for any necessary maintenance actions would be documented as an ALI.

Extending the operational limit of an airplane raises implications for the validity of any subsequent repairs, alterations or modifications. Accordingly, any person seeking approval for installation of any repair, alteration, or modification would be required to perform an evaluation of that repaired, altered, or modified structure. Persons seeking approval of any repair, alteration, or modification would be required to use the guidelines specified in § 25.1807, or other guidelines approved by the FAA oversight office. The guidelines would provide a standardized WFD methodology for evaluating any repair, alteration, or modification.

The evaluation might conclude that a proposed repair, alteration, or modification is not susceptible to WFD or that WFD is not likely to occur before the subject airplane reaches the extended operational limit. As a result,

[7] Those design changes that increase the maximum takeoff gross weight from 75,000 pounds or less, to greater than 75,000 pounds would be excluded, because they are covered in § 25.1807.

the person seeking approval would not be required to take any further actions for that proposed repair, alteration, or modification. Conversely, the evaluation might conclude that WFD is likely to occur before the affected airplane reaches the extended operational limit. Such an evaluation would require persons seeking approval to show that WFD is not likely to occur up to that limit either by modifying the proposed repair, alteration, or modification or by developing maintenance actions to be performed by the affected operator at identified times.

H. Compliance Plan (section 1807, section 1809)

The FAA intends to establish the requirements for a compliance plan to ensure that affected persons and the FAA have a common understanding and agreement of what is necessary to achieve compliance with these sections. The plan will also ensure that the affected persons produce the ALS and service information and guidelines in a timely manner that are acceptable in content and format. Integral to the compliance plan will be the inclusion of procedures to allow the FAA to monitor progress toward compliance. These aspects of the plan will help ensure that the expected outcomes will be acceptable and on time for incorporation by the affected operators into their maintenance programs in accordance with the operational rules contained in this proposal.

The affected design approval holders would be required to submit a compliance plan that addresses the following:

- The proposed schedule for meeting the compliance dates, including all major milestones.
- A proposed means of compliance with the initial operational limit requirement.
- Any planned deviations from guidance provided in FAA advisory material.
- A draft of all required compliance items not less than 60 days before the stated compliance dates.
- Repairs, alterations, and modifications.
- Continuous assessment of the affected large transport category airplane fleet relative to the potential for WFD prior to the initial operational limit.
- Distribution of approved initial operational limits.

The compliance plan is based substantially on ‘‘The FAA and Industry Guide to Product Certification,’’ which describes a process for developing project-specific certification plans for type certification programs, which is available at *http://www.faa.gov/certification/aircraft.*

This guide recognizes the importance of ongoing communication and cooperation between applicants and the FAA. This proposal, while regulatory in nature, is intended to encourage the establishment of the same type of relationship in the process of complying with this section.

One of the items required in the plan is, ‘‘If the proposed means of compliance differs from that described in FAA advisory material, a detailed explanation of how the proposed means will comply with this section.’’ We will issue an AC to include guidance on the aspects of a compliance plan. FAA advisory material is never mandatory because it describes one means, but not the only means of compliance. In the area of type certification, applicants frequently propose acceptable alternatives to the means described in advisory circulars. When an applicant chooses to comply by an alternative means, it is important to identify this as early as possible in the certification process to provide an opportunity to resolve any issues that may arise that could lead to delays in the certification schedule.

The same is true of the requirement for design approval holders. As discussed earlier, compliance with this section on time by design approval holders is necessary to enable operators to comply with the operational requirements of this NPRM. Therefore, this item in the plan would enable the FAA oversight office to identify and resolve any issues that may arise with the proposal of the design approval holder without jeopardizing the ability of the design approval holder to comply by the compliance time.

This proposal, if adopted, would require TC holders and applicants to correct a deficient plan, or deficiencies in implementing the plan, in a manner identified by the FAA oversight office. Before the FAA formally notifies a TC holder or applicant of deficiencies, we will communicate with them to try to achieve a complete mutual understanding of the deficiencies and means of correcting them. Therefore, the notification referred to in this paragraph should document the agreed corrections.

The ability of an operator to comply with the proposed operating rules will be dependent on TC holders, certain STC holders, and applicants complying with § 25.1807. The FAA will carefully monitor compliance and take appropriate action if necessary. Failure to comply by the specified dates would constitute a violation of the requirements and may subject the violator to certificate action to amend, suspend, or revoke the affected certificate (49 U.S.C. 44709). It may also subject the violator to a civil penalty of not more than $25,000 per day per certificate until the violator complies with § 25.1807 (49 U.S.C. 46301).

This proposal, if adopted, would require a compliance date of March 18, 2007, for affected persons to submit a compliance plan to the FAA oversight office for approval. For those persons applying after the effective date of the rule for STCs or amendments to TCs that increase maximum takeoff gross weights from 75,000 pounds or less, to greater than 75,000 pounds, a plan for WFD compliance would be part of the overall compliance plan for those STCs or amendments to TCs. The affected persons would not have to address WFD until a compliance plan defining the certification basis for the overall STC or amended TC is needed. Those persons would have to comply by March 18, 2007, or within 90 days after the date of application, whichever occurs later.

The proposal also specifies compliance dates for submitting compliance plans for evaluating design changes and developing service information for maintenance actions that must be performed to preclude WFD. The compliance dates for the affected persons are as follows:

- Holders of STCs: no later than March 18, 2008.
- Applicants for STCs and amendments to TCs, if the certificate was not issued before the effective date of the final rule: no later than March 18, 2008, or within 90 days after the date of application, whichever occurs later.

IV. Proposed Operational Rules

In recent years, the FAA has identified a number of fleet-wide continued airworthiness issues that are not limited to particular type designs. Historically, we have issued ADs to require airplane operators to take corrective action to address these airworthiness issues. ADs are described in part 39. They address unsafe conditions that we determine are likely to exist or develop on other products of the same type design. Although ADs may be used to address fleet-wide issues, they are often more effective in addressing individual airplane issues. Accordingly, we believe that general rulemaking may be a more efficient and appropriate way to address fleet-wide safety problems. These new subparts provide locations for these types of requirements.

Earlier in this document, we described the proposed creation of a new subpart I in part 25. That subpart would provide a common location for similar regulatory requirements. We are also proposing new subparts in parts 121 and 129. These new subparts would contain rules from this proposal and other existing and future rules that pertain to continued airworthiness, in particular rules that address aging airplane issues. The FAA believes that the new subparts will enhance the reader's ability to readily identify rules pertinent to continued airworthiness. Unless we say otherwise, our purpose in moving requirements to the new subparts is to ensure easy visibility of those requirements applicable to the continued airworthiness of the airplane. We do not intend to change their legal effect in any other way.

A new subpart AA would be added to part 121 dealing with domestic air carriers and a new subpart B would be added to part 129 foreign air carriers and foreign persons operating U.S.-registered airplanes. This proposal, if adopted, would require persons holding an air carrier or operating certificate under part 119 to support the continued airworthiness of their airplanes. While most of the requirements of these subparts would address the need for improved maintenance, these subparts may also include requirements to modify airplanes or take other actions that we consider necessary for continued airworthiness.

After June 18, 2008, an affected operator could not operate an airplane unless the operator has incorporated an ALS approved under appendix H to part 25 or § 25.1807 into its maintenance program. This ALS would contain the operational limit stated as a number of total accumulated flight cycles or flight hours approved under § 25.571 or § 25.1807. Furthermore, the ALS must be clearly distinguishable within the certificate holder's maintenance program. This means the ALS must be designated as a stand-alone portion of the program.

Under both current and proposed § 25.571, the FAA may issue a type certificate for an airplane model prior to completion of full-scale fatigue testing. Under this proposal, the type certificate holder would establish the initial operational limit upon completion of this testing. As under current § 25.571, the FAA intends for operators to be able to operate these airplanes while the design approval holder is performing the fatigue testing. Therefore, this proposal would not change the current provisions of § 25.571 that, if a type certificate is issued prior to completion of full-scale fatigue testing, the ALS must include a number equal to ½ the number of cycles accumulated on the fatigue test article. As additional cycles on the test article are accumulated, the number may be adjusted accordingly. This number is an Airworthiness Limitation and no airplane may be operated beyond the number stated in the ALS until the fatigue testing is completed and the initial operational limit is established.

Further operation would be prohibited unless an extended operational limit is incorporated into the operator's maintenance program, as discussed below.

To use an extended operational limit, the proposal would require operators to revise their maintenance programs to do the following:

- Incorporate the ALS containing the extended operational limit and any WFD ALI approved under § 25.1811.
- Incorporate the applicable guidelines for identifying and evaluating repairs, alterations, and modifications, that have been developed under § 25.1807, or other guidelines approved by the FAA oversight office.
- Make the extended operational limit, WFD ALIs, and applicable guidelines clearly distinguishable.

The extended operational limit might also have WFD ALIs because the evaluation performed under § 25.1811 concluded that WFD may occur on certain structure before the extended operational limit is reached. These WFD ALIs may include inspection start points, structural modification points, and inspection intervals and methods. WFD ALIs may take the form of inspections, modifications, or replacements of WFD-susceptible structure. The WFD ALI maintenance actions would be performed on airplane structure, including structure that has been repaired, altered or modified to support the extended operational limit. Any future proposed revisions to any of these ALIs would need to be submitted to the FAA oversight office through the Principal Maintenance Inspector (PMI) for approval.

The applicable incorporated guidelines would provide a means for operators to identify and evaluate repairs, alterations, and modifications susceptible to WFD that have been installed on transport category airplanes operating under an extended operational limit. The only repairs, alterations or modifications needing a WFD evaluation would be those identified in the applicable guidelines and would not include TC holder's repairs identified according to § 25.1807(g)(1).

The fatigue life on those repairs would generally be greater than the period of time the airplane has to go from its initial operational limit to its extended operational limit. For example, if a repair that has been identified in the TC holders structural repair manual has been evaluated to support an initial operational limit stated as 60,000 flight cycles, then that repair would generally be valid up to 60,000 flight cycles. If that repair is installed after an airplane is approved for an extended operational limit, the repair would generally be valid up to 60,000 flight cycles after installation. If we assume an extended operational limit of 75,000 total accumulated flight cycles for this example, and the airplane had 61,000 total accumulated flight cycles, the subject repair would generally be valid for the 14,000 flight cycles remaining under the extended operational limit.

The applicable guidelines would also provide a methodology for developing service information to support the extended operational limit. This service information would consist of maintenance actions that may include inspection, modification, or replacement of the repair, alteration, or modification. Operators would be required to perform a WFD evaluation of these repairs, alterations, or modifications using the applicable guidelines. If the evaluation concludes that WFD is likely to occur before the extended operational limit, the operator would need to develop any necessary maintenance actions according to § 25.1813.

The evaluation and proposed maintenance action would be submitted to the FAA oversight office through the operator's PMI for approval. This submittal process keeps PMIs informed and gives them the opportunity to provide comments on the repair, alteration, or modification to the operator and FAA oversight office.

Operators would be required to evaluate any repair, alteration, or modification installed on the airplane after approval of an extended operational limit. The operator would use the guidelines developed according to the proposed § 25.1807 and incorporated under the proposed operating rule. Operators would be required to complete the evaluation and identify any necessary additional maintenance actions, if applicable, within 90 days after returning an airplane to service. The operator would have 90 days after approval by the FAA oversight office to revise its maintenance program to incorporate any approved ALIs. This time period allows for completion of the WFD evaluation and incorporation of any necessary maintenance actions into an operator's maintenance program. The airplane should not be at risk of structural failure due to WFD within the prescribed time period because WFD is a long-term fatigue problem.

As with other maintenance actions, before returning an airplane to service, operators would be required under existing regulations to ensure that the repair, alteration, or modification meets immediate and short-term strength requirements, such as the ultimate static strength requirements specified in part 25. There may be other actions and approvals associated with returning the affected airplane to service. Those actions and approvals would still apply as before.

Required maintenance program revisions would need to be submitted to the operator's PMI for review and approval. We are in the process of developing guidance for PMIs to ensure that their reviews are consistent and focused on the key implementation issues.

V. Additional Provisions

A. Relationship of This Proposal to Aging Airplane Regulatory Initiatives

As part of our broader review of several important initiatives comprising the Aging Airplane Program, we have revised certain compliance dates in existing rules and pending proposals so that operators can make required modifications during scheduled maintenance. Changing compliance dates affects our ability to expedite some aspects of this program but reduces the costs of the rules and proposals in place to deal with aging airplanes. Notice of these changes and a description of our Aging Airplane Program review appeared in the **Federal Register** on July 30, 2004 (69 FR 45936). In addition to this Widespread Fatigue Damage proposal, the actions affected by these revisions include:

• Fuel Tank Flammability Reduction (proposal),

• Aging Airplane Safety (interim final rule), and

• Enhanced Airworthiness Program for Airplane Systems/Fuel Tank Safety (proposal).

B. FAA Advisory Material

To help those persons affected by this proposed rule better understand what is necessary to show compliance with these proposed requirements, we are developing guidance material to supplement the proposed rule. We are revising AC 25.571–1C and proposing a new AC to include guidelines for the development of operational limits; service information for maintenance actions; and service information and guidelines for identifying and evaluating repairs, alterations, and modifications.

We incorporated, in part, the ARAC recommendation to revise AC 25.571–1C by including a definition for an initial operational limit; guidance for incorporation of the initial operational limit into the Airworthiness Limitations section; and guidance for providing evidence for demonstrating through full-scale fatigue testing that WFD will not occur before the initial operational limit.

We also incorporated, in part, the ARAC recommendations to revise AC 91–56, ''Continuing Structural Integrity Program for Large Transport Category Airplanes.'' AC 91–56A, which was issued on April 29, 1998, added Appendix 2, ''Guidelines for the Development of a Program to Predict and Eliminate Widespread Fatigue Damage.''

We are developing a new AC based, in part, on the ARAC recommendation to provide guidance for type certificate holders and others to perform WFD evaluations. The proposed AC includes:

• Guidelines for conducting a structural WFD evaluation.

• Illustrations of the structure susceptible to MSD and MED. These illustrations are by no means exhaustive and are included to stimulate the review of all possible affected structure.

• Guidance on developing a WFD prediction and verification technique.

• Evaluation of maintenance actions.

• Details of the documentation required by the FAA.

• Examples of structural repairs, alterations, and modifications.

This AC would also provide guidance for operators of affected airplanes on how to incorporate an FAA-approved ALS with an initial operational limit into their FAA-approved maintenance program; incorporate an extended operational limit and any applicable ALI to preclude WFD; and incorporate any new ALI developed as a result of evaluations to address repairs, alterations, and modifications installed after incorporation of an extended operational limit.

We invite public comments on the proposed ACs by separate notice, which will be published in the **Federal Register**.

C. FAA Oversight Office

We are also requiring affected persons to submit various compliance materials related to WFD to the FAA Oversight Office, defined in proposed § 25.1801(b). The FAA Oversight Office is the aircraft certification office or office within the Transport Airplane Directorate having oversight responsibility for the relevant TC or STC, as delegated by the Administrator. In other contexts, we have described the FAA office performing these functions as the ''cognizant FAA office.''

Table 4 lists the FAA offices that currently oversee issuance of TCs and amended TCs for manufacturers of transport category airplanes.

TABLE 4.—FAA OFFICES THAT OVERSEE TYPE CERTIFICATES

Airplane manufacturer	FAA oversight office
Aerospatiale	Transport Airplane Directorate, International Branch, ANM–116.
Airbus	Transport Airplane Directorate, International Branch, ANM–116.
BAE	Transport Airplane Directorate, International Branch, ANM–116.
Boeing	Seattle Aircraft Certification Office.
Bombardier	New York Aircraft Certification Office.
deHaviland	New York Aircraft Certification Office.
Embraer	Transport Airplane Directorate, International Branch, ANM–116.
Fokker	Transport Airplane Directorate, International Branch, ANM–116.
Gulfstream	Atlanta Aircraft Certification Office.
Lockheed	Atlanta Aircraft Certification Office.
McDonnell-Douglas.	Los Angeles Aircraft Certification Office.

D. Need for Training

The FAA recognizes that implementation of the proposed rule will be more complex than any other aging airplane program. We consider it essential that affected persons receive training to carry out the required actions. These persons include FAA PIs, Aviation Safety Inspectors, and ACO engineers, designees, operators, and maintenance personnel. We are developing training material based, in part, on the ARAC recommendations incorporated into this proposal and other considerations.

This training would include, but is not limited to public meetings, FAA-only seminars, formal FAA and industry training sessions, and industry workshops to enhance communication among industry, operators, and the

FAA. The FAA requests comments on this aspect of the proposed rule.

VI. Rulemaking Notices and Analyses

Authority for This Rulemaking

The FAA's authority to issue rules regarding aviation safety is found in Title 49 of the United States Code. Subtitle I, Section 106 describes the authority of the FAA Administrator. Subtitle VII, Aviation Programs, describes in more detail the scope of the agency's authority.

This rulemaking is promulgated under the authority described in Subtitle VII, Part A, Subpart III, Section 44701, ''General requirements.'' Under that section, the FAA is charged with promoting safe flight of civil aircraft in air commerce by prescribing

- Minimum standards required in the interest of safety for the design and performance of aircraft;
- Regulations and minimum standards in the interest of safety for inspecting, servicing, and overhauling aircraft; and
- Regulations for other practices, methods, and procedures the Administrator finds necessary for safety in air commerce.
- This regulation is within the scope of that authority because it prescribes—
- New safety standards for the design of transport category airplanes, and
- New requirements necessary for safety for the design, production, operation, and maintenance of those airplanes, and for other practices, methods and procedures relating to those airplanes.

Paperwork Reduction Act

This proposal contains the following new information collection requirements. As required by the Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)), the Department of Transportation has sent the information requirements associated with this proposal to the Office of Management and Budget for its review.

Title: Widespread Fatigue Damage.

Summary: This proposal consists of regulatory changes pertaining to widespread fatigue damage in transport category airplanes. Some of these changes would require new information collection. The proposed new information requirements and the persons who would be required to provide that information are described below.

(1) Proposed subpart I would require that existing design approval holders establish initial operational limits for transport category airplanes. Those persons would also be required to revise the Airworthiness Limitation section of the Instructions for Continued Airworthiness (ICA) to include an initial operational limit. This requirement would be necessary to ensure that the affected airplanes are evaluated for WFD and that an initial operational limit is established beyond which an airplane cannot be operated. By establishing this limit it would be assured that WFD, which would adversely affect safety, would be precluded in the airplane.

(2) Proposed subpart I would also require that design approval holders submit to the FAA a plan detailing how they intend to comply with the new requirements. The FAA would use this information to assist the design approval holder in complying with the new requirements. The compliance plan would be necessary to ensure that the design approval holders fully understand the requirements, correct any deficiencies in planning in a timely manner, and are able to provide the information needed by the operators for timely compliance with the rule.

(3) TC holders would be required to develop guidelines for addressing repairs, alterations, and modifications susceptible to MSD or MED. These guidelines would be used to identify and evaluate repairs, alterations, and modifications that may be installed on an affected airplane. This requirement is needed because TC holders have the data necessary to inform others of areas of the airplane that may be susceptible to WFD when repaired, altered, or modified.

(4) TC and STC holders would be required to develop service information to address repairs and modifications that would be susceptible to WFD before the airplane reaches the initial operational limit. Because this susceptibility is an unsafe condition, this service information would be mandated by airworthiness directive (AD) to support a proposed initial operational limit.

(5) Anyone operating an airplane under parts 121 and 129 would be required to revise their maintenance program to incorporate an ALS that includes an initial operational limit. Operators would be prohibited from operating an airplane past the initial operational limit.

(6) As an option, any person may apply for an extended operational limit for affected airplanes. This option would have requirements similar to those imposed on TC holders for establishing an initial operational limit. In addition, repairs, alterations, or modifications installed on an airplane with an extended operational limit would require identification and evaluation under § 25.1807(g). There may be service information developed that would support the extended limit and would be documented as airworthiness limitation items (ALIs). To operate beyond the initial operational limit, an operator would have to incorporate the extended limit and any WFD ALI into its maintenance program.

Use of: This proposal would support the information needs of the FAA in approving design approval holder and operator compliance with the proposed rule.

Average Annual Burden Estimate: The burden would consist of the work necessary to:

- Develop the revision to the existing ICA information
- Develop the compliance plan
- Incorporate the new information into the existing maintenance program

This proposed rulemaking would result in an annual recordkeeping and reporting burden as follows:

Documents required to show compliance with the proposed rule	Average annual hours	Present value discounted cost ($2,000)
FAA-approved revised or new ALS	132	8,606
FAA-approved WFD compliance plan	436	16,759
FAA-approved guidelines for repairs, alterations, and modifications	894	63,542
FAA-approved service information for repairs and modifications relative to initial operational limit	276	16,288
FAA-approved maintenance program revision for operators	29	4,340
FAA-approved program for extended operational limit (if applicable)	132	8,606
Total	1,899	$118,141

The FAA computed the annual recordkeeping (total hours) burden by analyzing the necessary paperwork requirements needed to satisfy each process of the proposed rulemaking. The average cost per hour varies due to the number of affected airplanes in each group, the amount of engineering time required to develop programs, and the amount of time required for each inspection.

The agency is seeking comments to—

- Evaluate whether the proposed information requirement is necessary for the proper performance of the roles of the agency, including whether the information will have practical utility;
- Evaluate the accuracy of the agency's estimate of the burden;
- Improve the quality, utility, and clarity of the information to be collected; and
- Minimize the burden of the collection of information on those who are to respond using appropriate automated, electronic, mechanical, or other technological collection techniques or other forms of information technology.

Individuals and organizations may submit comments to the FAA on the information collection requirement by July 17, 2006. You should send your comments to the address listed in the **ADDRESSES** section of this document.

Under the Paperwork Reduction Act of 1995, (5 CFR 1320.8(b)(2)(vi)), an agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control number for this information collection will be published in the **Federal Register**, after the Office of Management and Budget approves it.

International Compatibility

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

VII. Regulatory Evaluation, Regulatory Flexibility Determination, International Trade Impact Assessment, and Unfunded Mandates Assessment

This portion of the preamble summarizes the FAA's analysis of the economic impacts of this NPRM. It also includes summaries of the initial regulatory flexibility determination. We suggest readers seeking greater detail read the full regulatory evaluation, a copy of which we have placed in the docket for this rulemaking.

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

In conducting these analyses, the FAA has determined this proposed rule: (1) Has benefits that justify its costs, is a "significant regulatory action" as defined in section 3(f) of Executive Order 12866, and is "significant" as defined in DOT's Regulatory Policies and Procedures; (2) will have a significant economic impact on a substantial number of small entities; (3) will not reduce barriers to international trade; and does not impose an unfunded mandate on state, local, or tribal governments, or on the private sector. These analyses, available in the docket, are summarized below.

Total Costs and Benefits of This Rulemaking

The proposed rule is based, in part, on recommendations from the Aviation Rulemaking Advisory Committee (ARAC). Early in 2001, the FAA performed an extensive cost-benefit analysis of the ARAC proposal based on the data then available. Since then the proposed rule has been modified and more recent data has become available. The FAA updated the 2001 analysis to reflect changes in the proposed rule relative to the ARAC proposal. The FAA believes the analysis, as updated, properly reflects the cost and benefit determination. The FAA will further update the analysis, incorporating the latest data and information obtained from the NPRM, for the final rule. The costs of this proposal are the costs of the development of Widespread Fatigue Damage (WFD) programs by the airplane manufacturers and the incorporation of the WFD programs into the maintenance procedures of the airplane operators plus the inspection and structural modifications that may be required of the airplane operators. It is estimated that the total 20-year present value cost of this proposal is about $360 million. The benefits of this proposal consist of accident prevention and the prevention of unscheduled maintenance/downtime of fleets of aircraft. The present value benefits of this proposal, over 20 years, are estimated to be about $809 million.

Who Is Potentially Affected by This Rulemaking?

- Manufacturers of large transport category part 25 airplanes (airplanes with a maximum gross takeoff weight greater than 75,000 pounds).
- Applicants for type certificates or supplemental type certificates after the effective date of the rule for all transport category part 25 airplanes.
- Supplemental type certificate holders and applicants for amended part 25 type certificates.
- U.S. certificate holders and foreign air carriers and foreign persons operating U.S.-registered large transport category part 25 airplanes under 14 CFR parts 121 or 129.

Our Cost Assumptions and Sources of Information

- Discount rate—7%
- Period of analysis—20 years, 2001 through 2020
- Value of fatality averted—$3.0 million (Source: U.S. Department of Transportation, *Treatment of Value of Life and Injuries in Preparing Economic Evaluations,* January 19, 2002)
- Aircraft Values = Aviation Specialists Group (ASG)
- Aircraft Operational Data = Aircraft Analytical System (ACAS) Database
- Aircraft Accident Data = NTSB Database
- Aircraft Forecasts = Boeing
- Unit Cost of WFD Inspections = Airworthiness Assurance Working Group (AAWG)

In the design and certification process of an airplane, a type certificate applicant generally establishes an expected economic life for the airplane, known as a design service goal (DSG). For certain airplanes, design approval holders have performed additional fatigue tests, teardown inspections, and analyses to support changing DSG to extended service goals (ESG).

For purposes of the cost/benefit analysis in this evaluation, we used the existing service goal for an airplane (whether the service goal is a (DSG or ESG) as an analytical starting point for the initial operational limits (IOLs). The existing service goals are listed in Table 3. We have assumed that additional costs of compliance will be incurred at 100% and potentially again at 125% of this service goal. We note that Boeing plans to establish IOLs that would be 130 to 150 percent of the DSG or ESG for their airplanes. Since this action would support an IOL that could be substantially higher than the estimates used for a particular airplane, the costs of inspection and modification could exceed our estimates, while the costs of early retirement of useful airplanes could be less. Manufacturers of aircraft no longer in production, and with only a few airplanes in operation, are likely not to extend the current service goal.

The FAA seeks comments on these assumptions, and future plans to extend DSG or ESG and the establishment of initial operational limits.

Alternatives We Considered

The FAA considered five alternatives to the proposed rule. These were:

1. Exclude small entities.
2. Extend the compliance deadline for small entities.
3. Establish lesser technical requirements for small entities.
4. Expand the requirements to cover more airplanes.
5. Retire airplanes at the manufacturer's design or extended service goal.

The FAA concluded that Alternative 1, the option to exclude small entities from all the requirements of the proposed rule, was not justified. The purpose of the proposed rule is to maintain the airworthy operating condition of airplanes regardless of secondary considerations.

The FAA also considered options that would lengthen the compliance period for small operators (Alternative 2). The FAA believes time extensions only provide modest cost savings and leave the system safety at risk.

The FAA considered establishing lesser technical requirements for small entities (Alternative 3). However, the FAA believes the risks are similarly unreasonable for small entities operating airplanes susceptible to WFD, and that the benefits of including small entities justify the cost.

The FAA considered requiring all operators of existing transport category airplanes to comply with the proposed rule (Alternative 4). Over the past several years, TC holders have been addressing issues with aging airplane programs for airplanes with maximum takeoff gross weights greater than 75,000 pounds. Because of this, the FAA decided to restrict compliance to operators of those airplanes.

The FAA considered mandating the retirement of airplanes at an initial operating limit equivalent to the manufacturer's current service goal (DSG or ESG). This alternative would not allow a DAH to establish a higher initial operation limit based on identifying additional maintenance actions (inspections, modifications, or replacements) that would preclude WFD up to this higher limit.

Such a requirement would result in the removal of about 600 U.S. transport category airplanes at a cost of $7.6 billion or a present value of $3.4 billion. The FAA believes this alternative would present a substantial burden on industry and adversely affected the wide body cargo market. The *Sensitivity Studies* section of the full regulatory evaluation explores this option in more detail.

The FAA concludes the current proposal is the preferred alternative because it has benefits exceeding compliance costs and allows for continued operation of airplanes up to the point where maintenance actions can no longer ensure that the airplanes are free from widespread fatigue damage.

Comments Requested

We requested industry comment, with quantifiable support, for important assumptions made in the regulatory analysis. These comments are summarized below.

- We request manufacturers to identify, by airplane model, anticipated initial operational limits and if they plan to establish an initial operational limit for an airplane model that is higher than the existing service goal shown in Appendix 2 of this document.
- We request that operators identify airplane models that they desire to operate beyond the service goal identified in Appendix 2 of this document.
- We request comment on the future operational costs that this proposal will add for newly type certificated airplanes.
- We request comment from industry on any new technological WFD inspection methods, including costs per individual airplane models.
- We request comments on operators' practice of retiring airplanes beyond the service goal identified in Appendix 2 and the costs to operators of retiring and replacing airplanes at the service goal if the initial operational limit for the airplane is at the service goal for that airplane.
- We request comment on the number of components, by airplane model, likely to be affected by WFD-related problems. The greatest uncertainty with respect to the costs of compliance with the rule relates to the number of components for a fuselage type likely to be affected by WFD-related problems at or above 100% DSG or ESG.

Benefits of This Rulemaking

The present value benefits of this proposal consist of $726 million of accident prevention benefits and $83 million of detection benefits for total present value benefits of $809 million. The detection benefits are the benefits resulting from averted accidents and a reduction in unscheduled maintenance and repairs that would result from this proposal.

Costs of This Rulemaking

The costs of this proposal are those costs incurred by the airplane manufacturers for developing WFD programs, the airplane operators who incur the costs of inspection, aircraft retirement, and modifications to the airplanes, plus the costs incurred by the FAA.

The attributable costs of the rule do not include the expense of making repairs to structure that has been found to be cracked during any inspections resulting from the proposed rule. When any inspection procedure identifies a condition that renders the aircraft unairworthy, current FAA regulations [8] mandate actions to restore the aircraft to an airworthy condition.

To the extent that the repairs would already be required and already be performed under existing regulations, because of an operator's continuing responsibility to maintain the airworthiness of the aircraft, this assumption may overstate the net additional benefits from this rulemaking. This rulemaking is intended to ensure that problems are identified more rapidly, but the FAA assumes that all WFD problems will ultimately be discovered. The FAA and operators might identify WFD issues through other inspections or because of an accident in a similar aircraft, and therefore operators will have to make the repairs at some point. Accordingly, we request commenters to address the appropriate allocation of additional benefits, including, specifically, the nature and timing of repairs that would

[8] Sections 43.13, 91.7(a), 121.153(a)(2), and 129.14.

be undertaken as a result of this rulemaking.

The present value cost of this proposal, estimated over the 20-year study period, is about $360 million.

Under the proposal endorsed by the ARAC in 2001, the responsibility for developing inspection and modification procedures and for putting them into practice was to be borne by airplane operators. The costs of the rule were estimated under that assumption. We now estimate that the airplane manufacturers would incur approximately 10 percent and operators would incur approximately 90 percent of these costs. The total costs remain unchanged, however. We believe it is possible that the manufacturers' assumption of responsibility for testing and development would discover areas where WFD is likely to emerge and may reduce the need for preventive inspection and maintenance in other areas. The FAA is working with industry to develop compliance procedures and welcomes any additional information on the assumptions we made in these cost estimates.

Regulatory Flexibility Determination

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

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

The FAA conducted a complete regulatory flexibility analysis to assess the impact on small entities and discussed in detail following this initial regulatory evaluation. This rule would affect operators of airplanes, in the specified parts of the CFR. For operators, a small entity is defined as one with 1,500 or fewer employees.[9] As there are operators that met those criteria for a small business, the FAA conducted a small business economic impact assessment to determine if the rule would have a significant impact on a substantial number of these operators. As a result of the small business economic impact assessment the FAA believes that this proposal would result in a significant economic impact on a substantial number of small entities. A complete discussion is contained in the full regulatory evaluation filed separately in the docket.

Unfunded Mandates Assessment

Title II of the Act requires each Federal agency to prepare a written statement assessing the effects of any Federal mandate in a proposed or final agency rule that may result in an expenditure of $100 million or more (adjusted annually for inflation) in any one year by State, local, and tribal governments, in the aggregate, or by the private sector; such a mandate is deemed to be a ''significant regulatory action.'' The FAA currently uses an inflation-adjusted value of $120.7 million in lieu of $100 million. This proposed rule does not contain such a mandate. The requirements of Title II of the Act therefore do not apply.

Executive Order 13132, Federalism

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

Regulations Affecting Intrastate Aviation in Alaska

Section 1205 of the FAA Reauthorization Act of 1996 (110 Stat. 3213) requires the Administrator, when modifying regulations in Title 14 of the CFR in a manner affecting intrastate aviation in Alaska, to consider the extent to which Alaska is not served by transportation modes other than aviation, and to establish such regulatory distinctions as he or she considers appropriate. Because this proposed rule would apply to airplanes operated under parts 121 and 129, it could, if adopted, affect intrastate aviation in Alaska. The FAA, therefore, specifically requests comments on whether there is justification for applying the proposed rule differently to intrastate operations in Alaska.

[9] 13 CFR Part 121.201, Size Strandards Used to Define Small Business Concerns, Sector 48–49 Transportation, Subsector 481 Air Transportation.

Plain English

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

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

Please send your comments to the address specified in the **ADDRESSES** section.

Environmental Analysis

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

Regulations That Significantly Affect Energy Supply, Distribution, or Use

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

VIII. The Proposed Amendments

In consideration of the foregoing, the Federal Aviation Administration proposes to amend Chapter 1 of Title 14, Code of Federal Regulations, parts 25, 121, and 129, as follows:

List of Subjects

14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

14 CFR Part 121

Air carriers, Aircraft, Aviation Safety, Reporting and recordkeeping requirements, Safety, Transportation.

14 CFR Part 129

Air carriers, Aircraft, Aviation Safety, Reporting and recordkeeping requirements.

PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

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

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

2. Amend § 25.1 by adding new paragraphs (c) and (d) to read as follows:

§ 25.1 Applicability.

* * * * *

(c) This part also establishes requirements for holders of type certificates and changes to those certificates to take actions necessary to support the continued airworthiness of transport category airplanes.

(d) This part also establishes requirements for persons seeking approval for airplane repairs, alterations, or modifications.

3. Amend § 25.2 by adding a new paragraph (d) to read as follows:

§ 25.2 Special retroactive requirements.

* * * * *

(d) In addition to the requirements of this section, subpart I of this part contains requirements that apply to—

(1) Holders of type certificates and supplemental type certificates;

(2) Applicants for type certificates, amendments to type certificates (including service bulletins describing design changes), and supplemental type certificates; and

(3) Persons seeking approval for airplane repairs, alterations, or modifications.

4. Amend § 25.571 by revising paragraphs (a)(3) introductory text and (b) introductory text to read as follows:

§ 25.571 Damage-tolerance and fatigue evaluation of structure.

(a) * * *

(3) Based on the evaluations required by this section, inspections or other procedures must be established, as necessary, to prevent catastrophic failure, and must be included in the Airworthiness Limitations section (ALS) of the Instructions for Continued Airworthiness required by § 25.1529. The initial operational limit, stated as a number of total accumulated flight cycles or flight hours, established by this section must also be included in the ALS of the Instructions for Continued Airworthiness required by § 25.1529. Inspection thresholds for the following types of structure must be established based on crack growth analyses and/or tests, assuming the structure contains an initial flaw of the maximum probable size that could exist as a result of manufacturing or service-induced damage:

* * * * *

(b) *Damage-tolerance and widespread fatigue damage evaluation.* The evaluation must include a determination of the probable locations and modes of damage due to fatigue, corrosion, or accidental damage. Repeated load and static analyses supported by test evidence and (if available) service experience must also be incorporated in the evaluation. Special consideration for widespread fatigue damage must be included where the design is such that this type of damage could occur. An initial operational limit must be established that corresponds to the period of time, stated as a number of total accumulated flight cycles or flight hours, during which it is demonstrated that widespread fatigue damage will not occur in the airplane structure. This demonstration must be by full-scale fatigue test evidence. The type certificate may be issued prior to completion of full-scale fatigue testing, provided the Administrator has approved a plan for completing the required tests, and the Airworthiness Limitations section of the Instructions for Continued Airworthiness required by § 25.1529 of this part specifies that no airplane may be operated beyond a number of cycles equal to ½ the number of cycles accumulated on the fatigue test article, until such testing is completed. 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:

* * * * *

5. Amend part 25 by adding a new subpart I to read as follows:

Subpart I—Continued Airworthiness and Safety Improvements

Sec.

Subpart I—Continued Airworthiness and Safety Improvements

General

§ 25.1801 Purpose and definition.

(a) This subpart establishes requirements for support of the continued airworthiness of transport category airplanes. These requirements may include performing assessments, developing design changes, developing revisions to Instructions for Continued Airworthiness, and making necessary documentation available to affected persons. This subpart applies to the following persons, as specified in each section of this subpart:

(1) Holders of type certificates and supplemental type certificates.

(2) Applicants for type certificates and changes to type certificates (including service bulletins describing design changes). Applicants for changes to type certificates must comply with the requirements of this subpart in addition to the airworthiness requirements determined applicable under § 21.101 of this subchapter.

(3) Persons seeking approval for airplane repairs, alterations, or modifications that may affect airworthiness.

(b) For purposes of this subpart, the ‘‘FAA Oversight Office’’ is the aircraft certification office or office of the Transport Airplane Directorate with oversight responsibility for the relevant type certificate or supplemental type certificate, as determined by the Administrator.

§ 25.1803 [Reserved]

§ 25.1805 [Reserved]

Widespread Fatigue Damage

§ 25.1807 Initial operational limit: Widespread Fatigue Damage (WFD).

(a) *Applicability.* Except as provided in paragraph (i) of this section, this section applies to transport category airplanes with maximum takeoff gross weights greater than 75,000 pounds as approved during the original type certification of the airplane. It also applies to those airplanes certified with maximum takeoff gross weights of 75,000 pounds or less, and later increased to greater than 75,000 pounds by an amended type certificate or supplemental type certificate. These airplanes are referred to in this section as large transport category airplanes.

(b) *Initial operational limit.* To preclude WFD from occurring in the large transport category airplane fleet, each person identified in paragraph (c) of this section must comply with the following requirements:

(1) Perform an evaluation of airplane structural configurations to determine when WFD is likely to occur for structure susceptible to multiple site damage (MSD) or multiple element damage (MED). The airplane structural configurations to be evaluated consist of—

(i) All model variations and derivatives approved under the type certificate; and

(ii) All structural modifications and replacements, to the airplane structural configurations specified in paragraph (b)(1)(i), mandated by airworthiness directives as of [effective date of the final rule].

(2) Using the results from the evaluation performed in paragraph (b)(1) of this section, establish an initial operational limit, stated as a total number of accumulated flight cycles or flight hours.

(3) If the initial operational limit depends on performance of maintenance actions for which service information has not been mandated by airworthiness directive as of [effective date of the final rule], submit the following to the FAA Oversight Office:

(i) For those maintenance actions for which service information has been issued as of the applicable compliance date specified in paragraph (c) of this section, a list identifying each of those actions.

(ii) For those maintenance actions for which service information has not been issued as of the applicable compliance date specified in paragraph (c) of this section, a list identifying each of those actions and a binding schedule for providing in a timely manner the necessary service information for those actions. Once the FAA Oversight Office approves this schedule, you must comply with that schedule.

(4) Unless previously accomplished, establish an Airworthiness Limitations section (ALS) for each airplane structural configuration evaluated under paragraph (b)(1) and submit it to the FAA Oversight Office for approval. The ALS must include a section titled Widespread Fatigue Damage (WFD) that incorporates the applicable initial operational limit established under paragraph (b)(2) of this section.

(c) *Compliance dates for establishing the initial operational limit.* The following persons must comply with the requirements of paragraph (b) of this section by the specified date.

(1) Holders of type certificates (TC): no later than December 18, 2007.

(2) Applicants for TCs, if the date of application was before [effective date of the final rule]: no later than December 18, 2007, or the date the certificate is issued, whichever occurs later.

(3) Holders of either supplemental type certificates (STCs) or amendments to TCs that increase maximum takeoff gross weights from 75,000 pounds or less, to greater than 75,000 pounds: no later than December 18, 2007.

(4) Applicants for either STCs or amendments to TCs that increase maximum takeoff gross weights from 75,000 pounds or less, to greater than 75,000 pounds: no later than December 18, 2007, or the date the certificate is issued, whichever occurs later.

(d) *Compliance plan.* Each person identified in paragraph (e) of this section must submit a compliance plan consisting of the following:

(1) A proposed project schedule, identifying all major milestones, for meeting the compliance dates specified in paragraphs (c) and (h) of this section.

(2) A proposed means of compliance with paragraphs (b)(1) through (b)(4) of this section.

(3) If the proposed means of compliance differs from that described in FAA advisory material, a detailed explanation of how the proposed means will be shown to comply with this section.

(4) A proposal for submitting a draft of all compliance items required by paragraphs (b) and (g) of this section for review by the FAA Oversight Office not less than 60 days before the compliance date specified in paragraph (c) or (h) of this section, as applicable.

(5) A proposal for addressing repairs, alterations, and modifications as required by paragraph (g) of this section.

(6) A proposed process for continuously assessing service information related to WFD.

(7) A proposal for how the initial operational limit will be distributed.

(e) *Compliance dates for compliance plans.* The following persons must submit the compliance plan described in paragraph (d) of this section to the FAA Oversight Office by the specified date.

(1) Holders of type certificates (TC): no later than March 18, 2007.

(2) Applicants for TCs, if the date of application was before [effective date of the final rule]: no later than March 18, 2007.

(3) Holders of either supplemental type certificates (STC) or amendments to TCs that increase maximum takeoff gross weights from 75,000 pounds or less, to greater than 75,000 pounds: no later than March 18, 2007.

(4) Applicants for either STCs or amendments to TCs that increase maximum takeoff gross weights from 75,000 pounds or less, to greater than 75,000 pounds, if the date of application was before [effective date of the final rule]: no later than March 18, 2007.

(5) Applicants for either STCs or amendments to TCs that increase maximum takeoff gross weights from 75,000 pounds or less, to greater than 75,000 pounds, if the date of application was after [effective date of the final rule]: no later than March 18, 2007, or within 90 days after the date of application, whichever occurs later.

(f) *Compliance plan deficiencies.* Each affected person must implement the compliance plan as approved in compliance with paragraph (d) of this section. If either paragraph (f)(1) or (2) of this section applies, the affected person must submit a corrected plan to the FAA Oversight Office and implement the corrected plan within 30 days after such notification.

(1) The FAA Oversight Office notifies the affected person of deficiencies in the proposed compliance plan and how to correct them.

(2) The FAA Oversight Office notifies the affected person of deficiencies in the person's implementation of the plan and how to correct them.

(g) *Widespread fatigue damage service information and guidelines.* Each person identified in paragraph (h) of this section must submit the following to the FAA Oversight Office for approval—

(1) An identification of repairs and modifications described in structural repair manuals, service bulletins, and other service information and design approvals developed by the person, that may be susceptible to WFD along with an evaluation to determine when WFD is likely to occur in affected structure susceptible to multiple site damage or multiple element damage;

(2) Service information for maintenance actions that must be performed to preclude WFD from occurring before the airplane reaches the established initial operational limit, if the evaluation required by paragraph

(g)(1) of this section concludes that WFD is likely to occur before the initial operational limit established under paragraph (b) of this section; and

(3) Guidelines for—

(i) Identifying repairs, alterations, and modifications, other than those specified in paragraph (g)(1) of this section, that may be susceptible to WFD;

(ii) Evaluating repairs, alterations, and modifications identified in paragraph (g)(3)(i) of this section to determine when WFD is likely to occur in affected structure; and

(iii) Developing service information for maintenance actions that must be performed to preclude WFD for those repairs, alterations, and modifications identified in paragraph (g)(3)(i) of this section.

(4) Once approved by the FAA Oversight Office, the documents required by this paragraph must be made available to owners and operators of affected airplanes subject to this section and to affected persons subject to § 25.1809 of this subpart.

(h) *Compliance dates for establishing the service information and guidelines.* The following persons must comply with the requirements of paragraph (g) of this section by the specified date.

(1) Holders of type certificates (TC): no later than December 18, 2009.

(2) Applicants for TCs, if the date of application was before [effective date of the final rule]: no later than December 18, 2009, or the date the certificate is issued, whichever occurs later.

(3) Applicants for amendments to TCs that increase maximum takeoff gross weights from 75,000 pounds or less, to greater than 75,000 pounds: no later than December 18, 2009, or the date the certificate is issued, whichever occurs later.

(i) This section does not apply to the following airplane models:

(1) Bombardier BD–700

(2) Gulfstream G–V

(3) Gulfstream G–VSP

(4) British Aerospace, Aircraft Group and Societe Nationale Industrielle Aerospatiale Concorde Type 1

§ 25.1809 Changes to type certificates: Widespread Fatigue Damage (WFD).

(a) *Applicability.* Except as stated in paragraph (b) of this section, this section applies to supplemental type certificates (STCs) and amendments to type certificates (ATC)—

(1) For transport category airplanes for which initial operational limits are established under § 25.1807 of this subpart; and

(2) That are identified using the guidelines developed according to § 25.1807(g)(3) of this subpart.

(b) This section does not apply to STCs or ATCs covered by § 25.1807(c)(3) or (4) of this subpart.

(c) *WFD Evaluation.* Each person identified in paragraph (d) of this section must do the following:

(1) Perform an evaluation to determine if any new structure or any structure affected by the change is susceptible to WFD and, if so, when WFD is likely to occur. This evaluation must be performed using:

(i) Guidelines specified in § 25.1807(g)(3)(i) and (ii) of this subpart; or

(ii) Guidelines approved by the FAA Oversight Office.

(2) If the evaluation required by paragraph (c)(1) of this section concludes that WFD is likely to occur before the initial operational limit, develop the maintenance actions that must be performed to preclude WFD from occurring before the airplane reaches the established initial operational limit. These maintenance actions must be developed using:

(i) Guidelines specified in § 25.1807(g)(3)(iii) of this subpart; or

(ii) Guidelines approved by the FAA Oversight Office.

(3) Submit to the FAA Oversight Office for approval the maintenance actions required by paragraph (c)(2) of this section. Once approved, service information for those actions must be made available to owners and operators of affected airplanes subject to this section.

(d) *Compliance dates for evaluating changes to type certificates.* The following persons must comply with the requirements of paragraph (c) of this section by the dates specified.

(1) Holders of STCs: No later than December 18, 2010.

(2) Applicants for STCs or for amendments to TCs: no later than December 18, 2010, or the date the certificate is issued, whichever occurs later.

(e) *Compliance plan.* Each person identified in paragraph (f) of this section must submit a compliance plan consisting of the following:

(1) A proposed project schedule, identifying all major milestones, for meeting the compliance dates specified in paragraph (d) of this section.

(2) A proposed means of compliance with paragraphs (c)(1) through (c)(3) of this section.

(3) If the proposed means of compliance differs from that described in FAA advisory material, a detailed explanation of how the proposed means will be shown to comply with this section.

(4) A proposal for submitting a draft of all compliance items required by paragraph (b) of this section, as applicable, for review by the FAA Oversight Office not less than 60 days before the compliance dates specified in paragraph (d) of this section, as applicable.

(5) A proposed process for continuously assessing service information related to WFD.

(6) A proposal for how the approved service information will be distributed.

(f) *Compliance dates for compliance plans.* The following persons must submit the compliance plan described in paragraph (e) of this section to the FAA Oversight Office by the specified dates.

(1) Holders of STCs: no later than March 18, 2008.

(2) Applicants for STCs or amendments to TCs: No later than March 18, 2008, or within 90 days after the date of application, whichever occurs later.

(g) *Compliance plan deficiencies.* Each affected person must implement the compliance plan as approved in compliance with paragraph (e) of this section. If either paragraph (g)(1) or (2) of this section applies, the affected person must submit a corrected plan to the FAA Oversight Office and implement the corrected plan within 30 days after such notification.

(1) The FAA Oversight Office notifies the affected person of deficiencies in the proposed compliance plan and how to correct them.

(2) The FAA Oversight Office notifies the affected person of deficiencies in the person's implementation of the plan and how to correct them.

§ 25.1811 Extended operational limit: Widespread Fatigue Damage (WFD).

(a) *Applicability.* Any person may apply to extend an operational limit approved under § 25.571 of subpart C, § 25.1807 of this subpart, or this section. Extending the operational limit is a major change. The applicant must comply with the relevant provisions of subparts D or E of part 21 of this subchapter and paragraph (b) of this section:

(b) *Extended operational limit.* To preclude WFD from occurring in the transport category airplane fleet, each person applying for an extended operational limit must comply with the following requirements:

(1) Perform an evaluation of the airplane structural configuration to determine when WFD is likely to occur for structure susceptible to multiple site damage or multiple element damage. The airplane structural configuration to be evaluated consists of—

(i) All model variations and derivatives approved under the type certificate for which approval for an extension is sought; and

(ii) All structural repairs, alterations, and modifications installed on each affected airplane, whether or not required by airworthiness directive, up to the date of approval of the extended operational limit.

(2) Using the results from the evaluation performed in paragraph (b)(1) of this section, establish an extended operational limit, stated as a total number of accumulated flight cycles or flight hours.

(3) Establish a supplement to the Airworthiness Limitations section (ALS) and submit it to the FAA Oversight Office for approval. The supplemental ALS must include a section titled Widespread Fatigue Damage (WFD) that incorporates the applicable extended operational limit established under paragraph (b)(2) of this section.

(4) Develop the maintenance actions determined by the WFD evaluation performed in paragraph (b)(1) of this section to be necessary to preclude WFD from occurring before the airplane reaches the proposed extended operational limit. These maintenance actions must be documented as airworthiness limitation items in the ALS and submitted to the FAA Oversight Office for approval.

§ 25.1813 Repairs, alterations, and modifications: Widespread Fatigue Damage (WFD).

(a) *Applicability.* This section applies to modifications identified according to § 25.1807(g)(1) of this chapter and to repairs, alterations, and modifications identified using the guidelines developed under § 25.1807(g)(3) of this subpart, that are proposed for installation on transport category airplanes with an extended operational limit approved under § 25.1811 of this subpart.

(b) *Repairs, alterations, or modification requirements.* Each person seeking approval for any repair, alteration, or modification must comply with the following:

(1) Perform an evaluation according to the applicable guidelines developed under section § 25.1807(g)(3) of this subpart to determine if any new structure or any structure affected by the repair, alteration, or modification is susceptible to WFD and, if so, when it is likely to occur. This evaluation must be performed using those guidelines or guidelines approved by the FAA Oversight Office.

(2) If the evaluation required by paragraph (b)(1) of this section concludes that WFD is likely to occur before the extended operational limit established under § 25.1811 of this subpart, either—

(i) Modify the proposed repair, alteration, or modification to preclude WFD from occurring before the airplane reaches the extended operational limit; or

(ii) Develop the maintenance actions that must be performed to preclude WFD from occurring before the airplane reaches the extended operational limit. These maintenance actions must be developed using:

(A) Guidelines specified in § 25.1807(g)(3)(iii) of this subpart; or

(B) Guidelines approved by the FAA Oversight Office.

(3) The maintenance actions identified in paragraph (b)(2) of this section must be documented as airworthiness limitation items, submitted to the FAA Oversight Office for approval, and be made available to owners and operators of affected airplanes subject to this section.

Appendix H to Part 25—Instructions for Continued Airworthiness

* * * * *

6. Amend H25.3 of Appendix H by adding paragraph (h) to read as follows:

H25.3 *Content*

* * * * *

(h) Guidelines for identifying and evaluating repairs, alterations, and modifications to structure that may be susceptible to WFD and compromise the ability of the airplane to reach the initial operational limit.

7. Amend H25.4 of Appendix H by revising paragraph (a)(1), adding and reserving paragraph (a)(3), and adding paragraph (a)(4) to read as follows.

Appendix H to Part 25—Instructions for Continued Airworthiness

* * * * *

H25.4 *Airworthiness Limitations Section*

* * * * *

(a) * * *

(1) Each mandatory modification time, replacement time, structural inspection interval, and related structural inspection procedures approved under § 25.571.

* * * * *

(4) An operational limit, stated as a total number of accumulated flight cycles or flight hours, approved under § 25.571 of this part.

* * * * *

PART 121—OPERATING REQUIREMENTS: DOMESTIC, FLAG, AND SUPPLEMENTAL OPERATIONS

8. The authority citation for part 121 continues to read:

Authority: 49 U.S.C. 106(g), 40113, 40119, 41706, 44101, 44701–44702, 44705, 44709–44711, 44713, 44716–44717, 44722, 44901, 44903–44904, 44912, 45101–45105, 46105, 46301.

9. Amend § 121.1 by adding a new paragraph (g) to read as follows:

§ 121. Applicability.

* * * * *

(g) This part also establishes requirements for operators to take actions to support the continued airworthiness of each airplane.

10. Amend part 121 by adding subpart AA to read as follows:

Subpart AA—Continued Airworthiness and Safety Improvements

Subpart AA—Continued Airworthiness and Safety Improvements

§ 121.1101 Purpose and definition.

(a) This subpart requires persons holding an air carrier or operating certificate under part 119 of this chapter to support the continued airworthiness of each airplane. These requirements may include, but are not limited to, revising the maintenance program, incorporating design changes, and incorporating revisions to Instructions for Continued Airworthiness.

(b) For purposes of this subpart, the ''FAA Oversight Office'' is the aircraft certification office or office of the Transport Airplane Directorate with oversight responsibility for the relevant type certificate or supplemental type certificate, as determined by the Administrator.

§ 121.1103–§ 121.1113 [Reserved]

§ 121.1115 Widespread fatigue damage.

(a) *Applicability.* This section applies to certificate holders operating transport category airplanes for which an operational limit has been established under § 25.571, § 25.1807, or § 25.1811 of this chapter.

(b) *Operational limit.* No certificate holder may operate an airplane identified in paragraph (a) of this section after June 18, 2008, unless an Airworthiness Limitations section (ALS) approved under appendix H to part 25 or § 25.1807 of this chapter is incorporated into its maintenance program. The ALS must—

(1) Include an operational limit approved under § 25.571 or § 25.1807 of this chapter, as applicable, except as provided in paragraph (c) of this section; and

(2) Be clearly distinguishable within its maintenance program.

(c) *Extended operational limit.* No certificate holder may operate an airplane beyond the operational limit specified in paragraph (b)(1) of this section, unless the following conditions are met:

(1) An ALS must be incorporated into its maintenance program that—

(i) Includes an extended operational limit and any widespread fatigue damage (WFD) airworthiness limitation items (ALIs) approved under § 25.1811 of this chapter; and

(ii) Is approved under § 25.1811 of this chapter;

(2) Its maintenance program must incorporate the applicable guidelines for identifying and evaluating repairs, alterations, and modifications that have been developed according to § 25.1807(g)(3), or other guidelines approved by the FAA Oversight Office.

(3) The extended operational limit, WFD ALIs, and applicable guidelines must be clearly distinguishable within its maintenance program.

(d) *Repairs, alterations, and modifications.* This paragraph applies to modifications identified according to § 25.1807(g)(1) of this chapter and to repairs, alterations, and modifications identified in the applicable guidelines developed according to § 25.1807(g)(3) of this chapter, when installed on airplanes operating under an extended operational limit. Any certificate holder returning an airplane to service after such a repair, alteration, or modification must do the actions required by paragraph (d)(1) and (d)(2) of this section. These actions are in addition to any other actions and approvals required by this chapter.

(1) Within 90 days after return to service—

(i) Perform a WFD evaluation of the repair, alteration, or modification;

(ii) Develop any necessary maintenance actions according to § 25.1813 of this chapter; and

(iii) Submit the evaluation and proposed maintenance actions to the FAA Oversight Office through the Principal Maintenance Inspector for approval.

(2) Within 90 days after approval by the FAA Oversight Office, revise the maintenance program to incorporate any WFD ALI approved under this section.

(e) *Principal Inspector approval.* Certificate holders must submit the maintenance program revisions required by paragraphs (b), (c), and (d) of this section to the Principal Maintenance Inspector for review and approval.

§ 121.368 [Redesignated]

11. Redesignate § 121.368 as new § 121.1105.

§ 121.368 [Reserved]

12. A new § 121.368 is added and reserved.

§ 121.370 [Redesignated]

13. Redesignate § 121.370 as new § 121.1107.

§ 121.370 [Reserved]

14. A new § 121.370 is added and reserved.

§ 121.370a [Redesignated]

15. Redesignate § 121.370a as new § 121.1109.

§ 121.370a [Reserved]

16. A new § 121.370a is added and reserved.

PART 129—OPERATIONS: FOREIGN AIR CARRIERS AND FOREIGN OPERATORS OF U.S.-REGISTERED AIRCRAFT ENGAGED IN COMMON CARRIAGE

17. The authority citation for part 129 continues to read:

Authority: 49 U.S.C. 1372, 40113, 40119, 44101, 44701–44702, 44705, 44709–44711, 44713, 44716–44717, 44722, 44901–44904, 44906, 44912, 46105, Pub. L. 107–71 sec. 104.

18. Amend § 129.1 by revising paragraph (b), and adding a new paragraph (d) to read as follows:

§ 129.1 Applicability and definitions.

* * * * *

(b) *Operations of U.S.-registered aircraft solely outside the United States.* In addition to the operations specified under paragraph (a) of this section, §§ 129.14 and 129.20 and subpart B of this part also apply to U.S.-registered aircraft operated solely outside the United States in common carriage by a foreign air carrier or foreign person.

* * * * *

(d) This part also establishes requirements for a foreign air carrier or foreign person to take actions to support the continued airworthiness of each airplane.

19. Amend part 129 by adding subpart A heading to read as set forth below, and designating §§ 129.1, 129.11, 129.13 through 129.15 and §§ 129.17 through 129.21, and §§ 129.23, 129.25, 129.28, and 129.29 into subpart A to read as follows:

Subpart A—General

* * * * *

20. Amend part 129 by adding subpart B to read as follows:

Subpart B—Continued Airworthiness and Safety Improvements

Sec.

Subpart B—Continued Airworthiness and Safety Improvements

§ 129.101 Purpose and definition.

(a) This subpart requires a foreign air carrier or foreign person operating a U.S.-registered airplane in common carriage to support the continued airworthiness of each airplane. These requirements may include, but are not limited to, revising the maintenance program, incorporating design changes, and incorporating revisions to Instructions for Continued Airworthiness.

(b) For purposes of this subpart, the ‘‘FAA Oversight Office’’ is the aircraft certification office or office of the Transport Airplane Directorate with oversight responsibility for the relevant type certificate or supplemental type certificate, as determined by the Administrator.

§ 129.103–§ 129.113 [Reserved]

§ 129.115 Widespread fatigue damage.

(a) *Applicability.* This section applies to foreign air carriers or foreign persons operating U.S.-registered transport category airplanes for which an operational limit has been established under § 25.571, § 25.1807, or § 25.1811 of this chapter.

(b) *Operational limit.* No foreign air carrier or foreign person may operate a U.S.-registered airplane identified in paragraph (a) of this section after June 18, 2008, unless an Airworthiness Limitations section (ALS) approved under appendix H to part 25 or § 25.1807 of this chapter is incorporated into its maintenance program. The ALS must—

(1) Include an operational limit approved under § 25.571 or § 25.1807 of this chapter, as applicable, except as provided in paragraph (c) of this section; and

(2) Be clearly distinguishable within its maintenance program.

(c) *Extended operational limit.* No foreign air carrier or foreign person may operate an airplane beyond the operational limit specified in paragraph (b)(1) of this section, unless the following conditions are met:

(1) An ALS must be incorporated into its maintenance program that—

(i) Includes an extended operational limit and any widespread fatigue damage (WFD) airworthiness limitation items (ALIs) approved under § 25.1811 of this chapter; and

(ii) Is approved under § 25.1811 of this chapter;

(2) Its maintenance program must incorporate the applicable guidelines for identifying and evaluating repairs, alterations, and modifications that have been developed according to § 25.1807(g)(3), or other guidelines approved by the FAA Oversight Office.

(3) The extended operational limit, WFD ALIs, and applicable guidelines must be clearly distinguishable within its maintenance program.

(d) *Repairs, alterations, and modifications.* This paragraph applies to modifications identified according to § 25.1807(g)(1) of this chapter and to repairs, alterations, and modifications identified in the applicable guidelines developed according to § 25.1807(g)(3) of this chapter, when installed on airplanes operating under an extended operational limit. Any foreign air carrier or foreign person returning an airplane to service after such a repair, alteration, or modification must do the actions required by paragraph (d)(1) and (d)(2) of this section. These actions are in addition to any other actions and approvals required by this chapter.

(1) Within 90 days after return to service—

(i) Perform a WFD evaluation of the repair, alteration, or modification;

(ii) Develop any necessary maintenance actions according to § 25.1813 of this chapter; and

(iii) Submit the evaluation and proposed maintenance actions to the FAA Oversight Office through the Principal Maintenance Inspector or cognizant Flight Standards International Field Office for review and approval.

(2) Within 90 days after approval by the FAA Oversight Office, revise the maintenance program to incorporate any WFD ALI approved under this section.

(e) *Principal Inspector approval.* Foreign air carriers or foreign persons must submit the maintenance program revisions required by paragraphs (b), (c), and (d) of this section to the Principal Maintenance Inspector or Flight Standards International Field Office for review and approval.

§ 129.16 [Redesignated]

21. Redesignate § 129.16 as new § 129.109.

§ 129.16 [Reserved]

22. A new § 129.16 is added and reserved.

§ 129.32 [Redesignated]

23. Redesignate § 129.32 as new § 129.107.

§ 129.32 [Reserved]

24. A new § 129.32 is added and reserved.

§ 129.33 [Redesignated]

25. Redesignate § 129.33 as new § 129.105.

§ 129.33 [Reserved]

26. A new § 129.33 is added and reserved.

Issued in Washington, DC on April 11, 2006.

John M. Allen,

Acting Director, Flight Standards Service, Aviation Safety.

Dorenda D. Baker,

Acting Director, Aircraft Certification Service, Aviation Safety.

[FR Doc. 06–3621 Filed 4–17–06; 8:45 am]

BILLING CODE 4910–13–P

Dated: May 16, 2006.

C. Miller Crouch,

Principal Deputy Assistant Secretary for Educational and Cultural Affairs, Department of State.

[FR Doc. E6–7772 Filed 5–19–06; 8:45 am]

BILLING CODE 4710–05–P

DEPARTMENT OF STATE

[Public Notice 5415]

Culturally Significant Objects Imported for Exhibition Determinations: ''Sheila Hicks: Weaving as Metaphor''

SUMMARY: Notice is hereby given of the following determinations: Pursuant to the authority vested in me by the Act of October 19, 1965 (79 Stat. 985; 22 U.S.C. 2459), Executive Order 12047 of March 27, 1978, the Foreign Affairs Reform and Restructuring Act of 1998 (112 Stat. 2681, *et seq.;* 22 U.S.C. 6501 note, *et seq.*), Delegation of Authority No. 234 of October 1, 1999, Delegation of Authority No. 236 of October 19, 1999, as amended, and Delegation of Authority No. 257 of April 15, 2003 [68 FR 19875], I hereby determine that an object to be included in the exhibition ''Sheila Hicks: Weaving as Metaphor,'' imported from abroad for temporary exhibition within the United States, is of cultural significance. The object is imported pursuant to a loan agreement with the foreign owner or custodian. I also determine that the exhibition or display of the exhibit object at The Brad Graduate Center for Studies in the Decorative Arts Design, and Culture, New York, New York, from on or about July 12, 2006, until on or about October 15, 2006, and at possible additional venues yet to be determined, is in the national interest. Public Notice of these Determinations is ordered to be published in the **Federal Register.**

FOR FURTHER INFORMATION CONTACT: For further information, including a list of the exhibit object, contact Julianne Simpson, Attorney-Adviser, Office of the Legal Adviser, U.S. Department of State (telephone: 202–453–8049). The address is U.S. Department of State, SA–44, 301 4th Street, SW., Room 700, Washington, DC 20547–0001.

Dated: May 16, 2006.

C. Miller Crouch,

Principal Deputy Assistant Secretary for Educational and Cultural Affairs, Department of State.

[FR Doc. E6–7760 Filed 5–19–06; 8:45 am]

BILLING CODE 4710–05–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Proposed Advisory Circular 120–YY, Widespread Fatigue Damage on Metallic Structure

AGENCY: Federal Aviation Administration, DOT.

ACTION: Notice of Availability of Proposed Advisory Circular (AC) 120–YY, and request for comments.

SUMMARY: This notice announces the availability of and requests comments on a proposed advisory circular (AC) which provides guidance to design approval holders for certain transport category airplanes and on repairs and alterations to those airplanes for developing means to preclude widespread fatigue. This proposed AC complements revisions to the airworthiness standards that are being proposed by a separate notice. This notice is necessary to give all interested persons an opportunity to present their views on the proposed AC.

DATES: We must receive your comments by July 17, 2006.

ADDRESSES: You must mail two copies of your comments on the proposed AC to: Federal Aviation Administration, Attention: Walter Sippel, Airframe and Cabin Safety Branch, ANM–115, FAA, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, WA 98055–4056. You can inspect comments at the above address between 7:30 a.m. and 4 p.m. weekdays, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: Jan Thor, Transport Standards Staff, at the address above, telephone (425) 227–2127.

SUPPLEMENTARY INFORMATION:

Comments Invited

We invite interested people to comment on the proposed AC by sending written data, views, or arguments. You should identify AC 120–YY and send two copies of your comments to the address specified above. We will consider all communications received by the closing date for comments. We will consider comments received late if it is possible to do so without incurring expense or delay. The proposed AC can be found and downloaded from the Internet at *http://www.faa.gov/aircraft/draft_docs.* A paper copy of the proposed AC may be obtained by contacting the person named above under the caption **FOR FURTHER INFORMATION CONTACT**.

Discussion

This proposed AC provides guidance to design approval holders on establishing operational limits (initial and extended) to preclude widespread fatigue damage for certain transport category airplanes. It also provides guidance for evaluating repairs and alterations to those airplanes for developing a means to preclude widespread fatigue damage. This AC also provides guidance to operators of those airplanes for use in incorporating Airworthiness Limitations sections with corresponding initial operational limits and airworthiness limitations items into their maintenance program. This guidance material applies to transport category airplanes operated under 14 CFR part 121 or part 129, that were certificated under the fail-safe and fatigue requirements of Civil Air Regulations (CAR) 4b or 14 Code of Federal Regulations (CFR) part 25; and

1. Have a maximum gross takeoff weight greater than 75,000 pounds, or
2. Were certificated with maximum takeoff gross weight of 75,000 pounds or less, and later increased to greater than 75,000 pounds by an amended type certificate or supplemental type certificate.

It is one means, but not the only means, of complying with the part 25 revisions proposed in Notice No. 06–04 entitled ''Widespread Fatigue Damage,'' which was published in the **Federal Register** on April 18, 2006 (71 FR 19928). Issuance of AC 120–YY is contingent on final adoption of the proposed revisions to part 25.

Issued in Washington, DC, on May 12, 2006.

Ali Bahrami,

Manager, Transport Airplane Directorate, Aircraft Certification Service.

Ricardo Domingo,

Acting Manager, Aircraft Maintenance Division, Flight Standards Service.

[FR Doc. E6–7794 Filed 5–19–06; 8:45 am]

BILLING CODE 4910–13–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Public Notice for Waiver of Aeronautical Land-Use Assurance; Mount Comfort Airport; Indianapolis, IN

AGENCY: Federal Aviation Administration, DOT.

ACTION: Notice of intent of waiver with respect to land.

SUMMARY: The Federal Aviation Administration (FAA) is considering a

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 25, 26, 121, and 129

[Docket No. FAA–2006–24281; Amendment Nos. 25–132, 26–5, 121–351, 129–48]

RIN 2120–AI05

Aging Airplane Program: Widespread Fatigue Damage

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: This final rule amends FAA regulations pertaining to certification and operation of transport category airplanes to prevent widespread fatigue damage in those airplanes. For certain existing airplanes, the rule requires design approval holders to evaluate their airplanes to establish a limit of validity of the engineering data that supports the structural maintenance program (LOV). For future airplanes, the rule requires all applicants for type certificates, after the affective date of the rule, to establish an LOV. Design approval holders and applicants must demonstrate that the airplane will be free from widespread fatigue damage up to the LOV. The rule requires that operators of any affected airplane incorporate the LOV into the maintenance program for that airplane. Operators may not fly an airplane beyond its LOV unless an extended LOV is approved.

DATES: These amendments become effective January 14, 2011.

FOR FURTHER INFORMATION CONTACT: If you have technical questions concerning this rule, contact Walter Sippel, ANM–115, Airframe/Cabin Safety Branch, Federal Aviation Administration, 1601 Lind Avenue SW., Renton, WA 98057–3356; telephone (425) 227–2774; facsimile (425) 227–1232; e-mail *walter.sippel@faa.gov.* If you have legal questions, contact Doug Anderson, Office of Regional Counsel, Federal Aviation Administration, 1601 Lind Avenue SW., Renton, WA 98057–3356; telephone (425) 227–2166; facsimile (425) 227–1007; e-mail *douglas.anderson@faa.gov.*

SUPPLEMENTARY INFORMATION:

Authority for This Rulemaking

The FAA's authority to issue rules on aviation safety is found in Title 49 of the United States Code. Subtitle I, section 106 describes the authority of the FAA Administrator. Subtitle VII–Aviation Programs describes in more detail the scope of the agency's authority.

This rulemaking is promulgated under the authority described in subtitle VII, part A, subpart III, section 44701, "General requirements." Under that section, the FAA is charged with promoting safe flight of civil aircraft in air commerce by prescribing minimum standards required in the interest of safety for the design and performance of aircraft; regulations and minimum standards in the interest of safety for inspecting, servicing, and overhauling aircraft; and regulations for other practices, methods, and procedures the administrator finds necessary for safety in air commerce. This regulation is within the scope of that authority because it prescribes—

- New safety standards for the design of transport category airplanes, and
- New requirements necessary for safety for the design, production, operation and maintenance of those airplanes and for other practices, methods, and procedures relating to those airplanes.

Contents

I. Executive Summary

This final rule requires certain actions to prevent catastrophic failure due to widespread fatigue damage (WFD) throughout the operational life of certain existing transport category airplanes and all those to be certificated in the future. Existing airplanes subject to the rule are turbine-powered airplanes with a type certificate issued after January 1, 1958, which have a maximum takeoff gross weight greater than 75,000 pounds and are operated under part 121 or 129. The rule applies to all transport category airplanes to be certificated in the future, regardless of maximum takeoff gross weight or how they are operated. The benefits of this rule are estimated at a present value of $4.8 million. The cost is estimated at a present value of $3.6 million.

FIGURE 1—WFD FINAL RULE BENEFITS AND COSTS

	Nominal value ($ millions)	7% Present value ($ millions)
Benefits	9.8	4.8
Costs	3.8	3.6

Fatigue damage to a metallic structure occurs when the structure is subjected to repeated loads, such as the pressurization and depressurization that occurs with every flight of an airplane. Over time this fatigue damage results in cracks in the structure, and the cracks may begin to grow together. Widespread fatigue damage is the simultaneous presence of fatigue cracks at multiple structural locations that are of sufficient size and density that the structure will no longer meet the residual strength requirements of § 25.571(b).[1] Structural fatigue characteristics of airplanes are understood only up to the point where analyses and testing of the structure are valid. There is concern about operating an airplane beyond that point for several reasons. One reason is that WFD is increasingly likely as the airplane ages, and is certain if the airplane is operated long enough. Another is that existing inspection methods do not reliably detect WFD because cracks are initially so small and may then link up and grow so rapidly that the affected structure fails before an inspection can be performed to detect the cracks.

To preclude WFD related incidents in existing transport category airplanes, this final rule requires holders of design approvals for those airplanes subject to the rule to perform the following actions:

1. Establish a limit of validity of the engineering data that supports the structural maintenance program (LOV);
2. Demonstrate that WFD will not occur in the airplane prior to reaching the LOV; and
3. Establish or revise the Airworthiness Limitations section in the Instructions for Continued Airworthiness to include the LOV.

As used in this preamble, the term "design approval holders" includes holders of type certificates, supplemental type certificates, or amended type certificates, and applicants for such approvals. In the context of this final rule, the design approval holder is generally the type certificate holder. Requiring design approval holders to perform the actions listed above is intended to support compliance by operators with today's amendments to parts 121 and 129. This final rule amends those parts to require that operators incorporate the LOV as airworthiness limitations into their maintenance program for each affected model that they operate.

The amendments to the operating rules have the effect of prohibiting operation of an airplane beyond its LOV. However, today's rule provides an option for any person to extend the LOV for an airplane and to develop the maintenance actions which support the extended limit. Thereafter, to operate an airplane beyond the existing LOV, an operator must incorporate the extended LOV and associated maintenance actions into its maintenance program. The airplane may not be operated beyond the extended LOV.

In response to comments on the notice of proposed rulemaking, the FAA has made a number of substantive changes which significantly reduce the costs presented in the proposal. The FAA has—

- Eliminated the requirement to evaluate WFD associated with most repairs, alterations, and modifications of the baseline[2] airplane structure.
- Simplified how an LOV may be extended.
- Extended the compliance dates by which design approval holders must establish an LOV for existing airplanes.
- Extended the time for operators to incorporate LOVs into their maintenance programs.
- Limited the applicability of the final rule to "transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958."

Today's rule requires that design approval holders take the necessary steps to preclude WFD in the future by requiring that they establish LOVs. Although the rule allows design approval holders to establish LOVs without relying on maintenance actions, the FAA expects most current design approval holders to adopt LOVs that will rely on such actions. Since WFD is by definition a condition in which structure will no longer meet the residual strength requirements of § 25.571(b), it could lead to a catastrophic failure. Thus the FAA would mandate those maintenance actions by airworthiness directive. The agency expects these actions to greatly reduce the number of unanticipated inspections and repairs resulting from emergency airworthiness directives the FAA issues when WFD is discovered in service. The FAA estimates the value of managing WFD with maintenance actions developed under this final rule versus the current practice of issuing airworthiness directives as WFD is found is worth $4.8 million in present value. There are other benefits of this rule that were not included in the final benefit assessment. They include prevention of accidents and a longer economic life for the airplane. The FAA estimates that this rule will cause one airplane to be retired because of its reaching the anticipated LOV in the 20-year analysis period. The retirement of this one airplane will result in costs of approximately $3.8 million, with a present value of approximately $3.6 million. This operator's cost is the only cost attributed to the final rule, since manufacturer costs were found to be minimal.

Thus, as noted earlier, this final rule's estimated present value benefits of $4.8 million exceed the estimated present value costs of approximately $3.6 million.

II. Background

A. Summary of the NPRM

On April 18, 2006, the FAA published a notice of proposed rulemaking (NPRM), entitled Aging Aircraft Program: Widespread Fatigue Damage.[3] That proposal was based on a recommendation from the Aviation Rulemaking Advisory Committee (ARAC). The NPRM contained extensive requirements for setting and supporting an initial operational limit for an airplane model. The FAA proposed that the rule apply to transport category airplanes with a maximum gross takeoff weight of greater than 75,000 pounds. The due date for comments was July 17, 2006.

The FAA proposed that design approval holders for those airplanes be required to take actions to preclude WFD. For new airplanes, the FAA proposed to amend § 25.571 and Appendix H to part 25 to require that applicants for a new type certificate establish an initial operational limit and include that limit in the Airworthiness Limitations section of the Instructions for Continued Airworthiness for the airplane. The agency also proposed that applicants develop guidelines for evaluating repairs, alterations, and modifications for WFD.

[1] After sustaining a certain level of damage, the remaining structure must be able to withstand certain static loads without failure. In the context of WFD, the damage is a result of the simultaneous presence of fatigue cracks at multiple locations in the same structural element (*i.e.,* multiple site damage) or the simultaneous presence of fatigue cracks in similar adjacent structural elements (*i.e.,* multiple element damage).

[2] Baseline structure means structure that is designed under the original type certificate or amended type certificate for that airplane model.

[3] 71 FR 19928

Section 25.1807 proposed that holders of design approvals for existing airplanes or applicants for such approvals be required to do the following:

1. Establish an initial operational limit; and
2. Establish a new Airworthiness Limitations section or revise an existing Airworthiness Limitations section to include the initial operational limit.

Section 25.1807(g) proposed that holders of design approvals for existing airplanes or applicants for such approvals be required to prepare the following:

1. A list of repairs and modifications developed and documented by the design approval holder;
2. Service information for maintenance actions necessary to preclude WFD from occurring before the initial operational limit; and
3. Guidelines for identifying, evaluating, and preparing service information for repairs, alterations, and modifications for which no service information exists.

For existing airplanes for which an initial operational limit is established, § 25.1809 proposed that design changes be evaluated for susceptibility to WFD and, if a change were susceptible, that the design approval holder identify when WFD is likely to occur and whether maintenance actions would be required. Section 25.1811 provided that any person could apply to extend an operational limit, using a process similar to that for establishing the initial operational limit. Under § 25.1813, certain repairs, alterations, and modifications proposed for installation on airplanes with an extended operational limit would also be evaluated.

The FAA proposed to amend the operating requirements of parts 121 and 129 to require that no operator could operate an airplane unless the initial operational limit or extended operational limit for the airplane had been incorporated into the operator's maintenance program.

The NPRM contains the background and rationale for this rulemaking and, except where the FAA has made revisions in this final rule, should be referred to for that information.

B. Related Activities

In July 2004, the FAA published the notice entitled "Fuel Tank Safety Compliance Extension (Final Rule) and Aging Airplane Program Update (Request for Comments)" [4] to propose airworthiness requirements for design approval holders to support certain operational rules. The FAA requested comments on the agency's proposal.

In July 2005, the FAA published a disposition of comments received in response to our request.[5] Also in July 2005, the agency published a policy statement, "Safety–A Shared Responsibility–New Direction for Addressing Airworthiness Issues for Transport Airplanes," [6] that explains our reasons for adopting requirements for design approval holders.

On May 22, 2006, the FAA published a Notice of Availability and request for comments on proposed Advisory Circular (AC) 120–YY, Widespread Fatigue Damage on Metallic Structure. The notice stated that the proposed AC could be found on the Internet at *http://www.faa.gov/aircraft/draft_docs.* This proposed advisory circular provides guidance to design approval holders on establishing initial and extended operational limits to preclude WFD for certain transport category airplanes and evaluating repairs, alterations, and modifications to the airplanes. The advisory circular also provides guidance to operators on incorporating the initial or extended operational limit and any related airworthiness limitation items into their maintenance programs. The notice specified that comments on the proposed advisory circular were to be received by July 17, 2006.

On July 7, 2006, at the request of a number of commenters, the FAA published a notice [7] extending the comment period on both the NPRM and proposed AC 120–YY to September 18, 2006. On August 18, 2006, the agency posted proposed AC 25.571–1X, Damage Tolerance and Fatigue Evaluation of Structure, on the Internet at *http://www.faa.gov/aircraft/draft_docs.* Comments on this document, which proposed revision of existing AC 25.571–1C, were due by October 21, 2006.

On November 26, 2006, the FAA held a public meeting with the ARAC Transport Airplane and Engine Issues Group. Under ARAC, the Airworthiness Assurance Working Group (AAWG) had previously provided recommendations to the FAA on how to address widespread fatigue damage. Because the FAA had received several comments concerning differences between the AAWG's recommendations and the NPRM, the meeting was held to discuss the reasons for these differences. The FAA's presentation at the meeting has been placed in the docket for this rulemaking. Except as discussed in the context of specific issues affecting this final rule, the FAA will not revisit those differences here.

On December 11, 2008, at the request of the Acting Administrator, the FAA held a public meeting to allow comments on the changes that had occurred to the rule since it had been proposed in the NPRM. A Technical Document describing those changes was posted in the docket, and the announcement of the meeting and opening of the comment period for the Technical Document was published in the **Federal Register** on Nov. 7, 2008 (73 FR 66205). The public was invited to submit comments on the Technical Document either in person at the meeting or by sending them to the docket. Seventy-one people attended the meeting and Boeing, the Air Transport Association of America (ATA), and FedEx made presentations, along with the FAA. Many attendees commented or asked questions. In addition, 12 commenters submitted comments about the Technical Document to the docket. The comment period closed on December 22, 2008.

While some of the comments received during the comment period for the Technical Document were new, many were restatements of comments made after publication of the NPRM. We address all of the comments, from both comment periods, in the section below. Comments received during both comment periods are posted to the docket. A transcript of the public meeting, including presentations given and comments delivered there, may also be found in the docket.

C. Differences Between NPRM and Final Rule

1. Substantive Changes

The FAA has eliminated the requirement to evaluate WFD associated with most repairs, alterations, and modifications of the baseline airplane structure.[8] The agency has also made a change in terminology. This final rule uses the term "limit of validity of the engineering data that supports the maintenance program" (LOV) rather than the term "initial operational limit." The FAA finds that the term "limit of validity" is more appropriate than the term "initial operational limit" in defining the point to which an airplane

[4] 69 FR 45936, July 30, 2004.

[5] 70 FR 40168, July 12, 2005: Fuel Tank Safety Compliance Extension (final rule) and Aging Airplane Program Update (Request for comments).

[6] 70 FR 40166, July 12, 2005 (PS–ANM110–7–12–2005).

[7] 71 FR 38540.

[8] The final rule requires that design approval holders evaluate airplane configurations that include modifications mandated by airworthiness directive.

may be safely operated. The requirements in this final rule for establishing the LOV under § 26.21 are that it be supported by test evidence and analysis at a minimum and, if available, by service experience or service experience and teardown inspection results for those airplanes of similar structural design with the highest total accumulation of flight cycles or flight hours (commonly referred to as high-time airplanes). This criterion is similar to the criterion used in § 25.571(b). This final rule also clarifies how the LOV may be extended, using the same type of evaluation as that required for setting the LOV under § 26.21.

In response to requests for more time, the FAA has extended the compliance dates by which design approval holders must establish an LOV for existing airplanes. Those dates vary according to the age of the airplanes, from 18 months after the effective date for the oldest airplanes to 60 months after the effective date for the newest ones. Additionally, the agency has extended the time for operators to incorporate LOVs into their maintenance programs. These dates vary with the age of the airplanes as well, and are 12 months later than the related design approval compliance dates, thus giving operators 12 months to incorporate the LOV into their maintenance programs. Operator compliance dates range from 30 to 72 months after the effective date. The FAA has also changed the proposed operational rules to correct an inadvertent ambiguity in the NPRM regarding obligations of operators of airplanes for which the type certificate holder might fail to establish an LOV as required.

Another change involves applicability to existing transport category airplanes. This final rule applies to "transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958." This limitation was added to make applicability of today's rule consistent with that of the other aging airplane rules. The FAA also added airplanes to the list of those excluded from the LOV requirements of § 26.21 because the airplanes are not operated under parts 121 or 129. Either they are being operated under different parts of the Code of Federal Regulations (CFR) or they are not in service at this time. The number of these airplanes still operating is very small, and the probability of their retirement in the near future is high.

2. Regulatory Evaluation Changes

The FAA has substantially revised the Regulatory Evaluation for several reasons. One concerns differences between the rule as proposed and the final rule. For example, the requirement to evaluate WFD associated with repairs, alterations, and modifications of the baseline airplane structure, except for those mandated by airworthiness directives, has been eliminated from this final rule. Another reason concerns information received during the rulemaking process which indicated that some of the initial assumptions about benefits and costs of the rule were not valid. For example, initially, the FAA assumed that design approval holders would set the LOV for a specific airplane model at the design service goal for that model. However, subsequently, some design approval holders indicated that they planned to set the LOV 33% to 180% higher. The net effect of these changes has been to dramatically reduce the costs estimated for compliance with the rule.

Our revised Regulatory Evaluation lists three potential sources of benefits of the rule, namely (1) prevention of accidents; (2) extension of the economic life of the airplane with corresponding revenues from that additional economic life; and (3) near elimination of emergency airworthiness directives.

Preventing a WFD accident is estimated to have benefits ranging from $20 million to $680 million. There are multiple factors, however, that make it difficult to forecast that this rule absolutely would prevent accidents. Among them are earlier FAA rulemaking actions to prevent known fatigue problems from reoccurring.

Similarly, although specific maintenance actions designed to extend the life of airplane structure have added years of service to the DC–9 fleet, quantification of such values for other models is unnecessary, given that benefits already exceed the nearly minimal costs.

As a result, the quantified benefit of this final rule is based solely on the near elimination of emergency ADs pertaining to WFD. The analysis assumes the rule will prevent 1.5 days of down time associated with emergency ADs.

3. New Part 26 for Design Approval Holders' Airworthiness Requirements

In the WFD proposed rule, and in proposals for other Aging Airplane Program rules, the FAA placed the airworthiness requirements for design approval holders in part 25, subpart I. As explained in the Enhanced Airworthiness Program for Airplane Systems/Fuel Tank Safety final rule (EAPAS/FTS),[9] the FAA decided after further review and input from industry and foreign aviation authorities to place these requirements in a new part 26 and move the enabling regulations into part 21.[10] The FAA determined that this was the best course of action because it keeps part 25 applicable only to airworthiness standards for transport category airplanes. This is important because it maintains harmonization and compatibility among the United States, Canada, and the European Union regulatory systems. Providing references to part 26 in part 21 clarifies how the part 26 requirements will address existing and future design approvals.

In creating part 26, the FAA renumbered the proposed sections of part 25, subpart I, and incorporated the changes discussed in this preamble. A table of this renumbering is shown below.

FIGURE 2—TABLE SHOWING RELATIONSHIP OF PROPOSED PART 25 SUBPART I TO PART 26 FINAL RULE

Part 26 final rule	Proposed part 25
SUBPART C—Aging Airplane Safety—Widespread Fatigue Damage	Subpart I—Continued Airworthiness
§ 26.5 Applicability table	New [11]
§ 26.21 Limit of validity (LOV)	§ 25.1807 Initial operational limit: Widespread Fatigue Damage (WFD).
	§ 25.1809 Changes to type certificates: Widespread Fatigue Damage (WFD).
§ 26.23 Extended limit of validity (LOV)	§ 25.1811 Extended operational limit: Widespread Fatigue Damage (WFD)

[9] 72 FR 63363, November 8, 2007.

[10] Certification Procedures for Products and Parts.

[11] This section, which includes an applicability table for part 26, was adopted as part of the EAPAS final rule.

FIGURE 2—TABLE SHOWING RELATIONSHIP OF PROPOSED PART 25 SUBPART I TO PART 26 FINAL RULE—Continued

Part 26 final rule	Proposed part 25
	§ 25.1813 Repairs, alterations, and modifications: Widespread Fatigue Damage (WFD).

4. New Subparts for Airworthiness Operational Rules

The WFD NPRM was among several Aging Airplane Program rulemaking initiatives that proposed new subparts (subparts AA and B in parts 121 and 129, respectively) for airworthiness requirements, and redesignated certain sections of parts 121 and 129. Since the EAPAS/FTS final rule was the first of these rulemaking initiatives to be codified, the new subparts and redesignated sections were adopted in that rule. Therefore, the FAA has removed the regulatory language and related discussion about these changes from this final rule. This final rule adds new sections that include WFD-related requirements: §§ 121.1115 and 129.115.

D. Summary of Comments

The FAA received comments about the NPRM from 40 commenters, including airplane manufacturers, operators, aviation associations, and others. The comments covered an array of topics and contained a range of responses. There was much support from airplane manufacturers, operators, and associations for the concept of precluding WFD in aging airplanes. There were also a number of recommendations for changes and requests for clarification. As previously discussed, at the December 11, 2008 public meeting, Boeing, FedEx, and ATA gave presentations of their responses to the Technical Document.

In addition, the FAA received comments about airworthiness requirements for design approval holders. We addressed many of the same or similar comments in the July 2005 disposition of comments document to the Fuel Tank Safety Compliance Extension (Final Rule) and Aging Airplane Program Update (Request for Comments). We also explained in detail the need for these requirements in our July 2005 policy statement. As a result, the FAA will not revisit those comments here.

III. Discussion of the Final Rule

A. Overview

1. Widespread Fatigue Damage

Widespread fatigue damage is the simultaneous presence of cracks at multiple structural locations that are of sufficient size and density that the structure will no longer meet the residual strength requirements of 14 CFR 25.571(b). This may result in catastrophic structural failure and loss of the airplane.

Fatigue is the gradual deterioration of a material subjected to repeated structural loads. When it occurs in more than one location, cracks manifest themselves as multiple site damage or multiple element damage. Multiple site damage is the simultaneous presence of fatigue cracks at multiple locations that grow together in the same structural element, such as a large skin panel or lap joint. Multiple element damage is the simultaneous presence of fatigue cracks in similar adjacent structural elements, such as frames or stringers. Some structural elements are susceptible to both types of damage, and both types may occur at the same time.

Cracks associated with multiple site damage and multiple element damage are initially so small that they cannot be reliably detected with existing inspection methods. Widespread fatigue damage is especially hazardous because these small, undetectable cracks in metallic structure can "link up" and grow very rapidly to bring about catastrophic failure of the structure. Although operators perform routine structural inspections to detect fatigue damage, fatigue cracks related to WFD grow so rapidly that operators cannot inspect susceptible structures often enough to detect the cracks before they cause structural failure. As a result, many of the findings of these types of cracks have been fortuitous: mechanics and others have observed fatigue cracks while doing other work. For example, cracks have been found by workers while stripping and painting an airplane. Cracks have also been found by mechanics conducting unrelated inspections of skin anomalies on the external fuselage; further investigation revealed multiple cracks in stringers and circumferential joints.

In other cases, undetected multiple site damage in wing or fuselage structure has eventually led to catastrophic failure of the structure in flight. For example, wing failures have resulted in losses of C–130 and P4Y–2 airplanes. Failures of aft pressure bulkheads have caused decompression of B–747, DC–9, and L–1011 airplanes.

Concern about WFD was brought to the forefront of public attention in April 1988, when an 18-foot-long section of the upper fuselage of a Boeing Model 737 airplane separated from the airplane during flight. The airplane, operated by Aloha Airlines, was en route from Hilo to Honolulu, Hawaii, at 24,000 feet. Onboard were 89 passengers and 6 crewmembers. A flight attendant died as a result of the accident, and eight passengers were injured.

The damage to the airplane consisted of a total separation and loss of a major portion of the upper crown skin and other structure. The damaged area extended from the main cabin entrance door aft for about 18 feet. At the time of the accident, the airplane had accumulated 89,680 flight cycles and 35,496 flight hours.

In the years after the Aloha Airlines accident, WFD was discovered in the following airplanes:

• *Boeing 727:* Cracking along a lap joint.

In 1998, during maintenance, two cracks were found growing out from underneath the lap joint. Disassembly of the joint revealed a 20-inch hidden crack from multiple site damage on the lower row of rivet holes in the inner skin.

• *Boeing 737:* Cracking along a lap joint.

In July 2003, a mechanic preparing to paint discovered extensive multiple site damage with up to 10 inches of local link-up of cracks in one area.

• *Boeing 747:* Cracking of the aft pressure bulkhead.

In 2005, Boeing issued service information to address multiple site damage of the aft pressure bulkhead radial lap splices. The service information was based on analysis and fatigue testing of the aft pressure bulkhead.

• *Boeing 767:* Cracking of the aft pressure bulkhead.

On November 5, 2003, cracks were found at multiple sites common to a single radial lap splice during an inspection of the aft pressure bulkhead.

• *McDonnell Douglas DC–9:* Cracking of the aft pressure bulkhead.

On June 22, 2003, widespread fatigue damage on a DC–9 airplane led to rapid decompression at 25,000 feet. Later inspection revealed multiple site damage with extensive link-up of cracks.

• *Lockheed C–130A:* Fatigue cracks in the wing structure.

On August 13, 1994, while responding to a forest fire in the Tahachapi Mountains near Pearblossom, California, the airplane experienced an in-flight separation of the right wing. All 3 flight crewmembers were killed, and the airplane was completely destroyed.

• *Lockheed C–130A:* Fatigue cracks in the wing structure.

On June 17, 2002, while executing a fire retardant drop over a forest fire near Walker, California, the airplane's wings folded upward at the center wing-to-fuselage attachment point, and the airplane broke apart. All three flight crewmembers were killed, and the airplane was completely destroyed.

• *Consolidated-Vultee P4Y–2:* Fatigue cracks in the wing structure.

On July 18, 2002, the airplane was maneuvering to deliver fire retardant over a forest fire near Estes Park, Colorado, when its left wing separated from the airplane. Both flight crewmembers were killed, and the airplane was destroyed. An examination of other Consolidated-Vultee P4Y–2 airplanes revealed that the area was difficult to inspect because of its location relative to fuselage structure.

• *Lockheed L–1011:* Failure in-flight of the aft pressure bulkhead stringer attach fittings.

In August 1995, an L–1011 airplane experienced a rapid decompression at 33,000 feet. Twenty stringer end fittings were found severed and the aft pressure bulkhead was separated from the fuselage crown by a crack approximately 12 feet long. The flight crew was unable to maintain cabin pressure control until after rapid descent.

• *Boeing 747:* Cracking of adjacent fuselage frames.

In 2005, during an overnight maintenance visit, missing skin fasteners common to a fuselage frame were discovered in the upper deck area. Further inspection revealed that the frame was severed. Substantial cracking was also found in the adjacent left and right frames.

• *Airbus A300:* Cracking of adjacent fuselage frames.

In 2002, investigations conducted as a result of fatigue cracks found on a test article and later in service revealed that cracking of certain adjacent fuselage frames could result in multiple element damage. The determination was based on analysis, service experience, and fatigue testing.

Since 1988, the FAA has issued approximately 100 airworthiness directives to address WFD in airplanes. Approximately 25 percent of these airworthiness directives were too urgent to allow the public an opportunity to comment in advance. These airworthiness directives required inspections, and the FAA later superseded the majority of them to expand the inspections or require modifications because inspections were not enough to preclude WFD.

Shortly after the Aloha Airlines accident, the AAWG [12] was formed to identify procedures to ensure continued structural airworthiness of aging transport category airplanes. Basic approaches defined by the group and accepted by the FAA included recommending procedures to preclude WFD in those airplanes. When ARAC was formed in 1991 to provide advice and recommendations on safety-related matters to the FAA, the AAWG became a working group under its auspices. In 2003 the AAWG completed its recommendation on WFD.

In 2004, the FAA tasked ARAC to "provide a written report on part 121 and 129 certificate holders operating airplanes with a maximum takeoff gross weight of greater than 75,000 pounds to assess the WFD characteristics of structural repairs, alterations, and modifications as recommended in a previous tasking of the Aviation Rulemaking Advisory Committee." [13] During the comment period on the NPRM for this final rule, the AAWG was working to complete Task 3, to recommend how an operator would include consideration of WFD for repairs, alterations, and modifications to airplanes operated under part 121 or 129.

On April 17, 2007, the AAWG presented its final report on Task 3 to ARAC. Many of the conclusions and recommendations in the final report are the same as those provided in the comments on the proposed rule which are discussed in this preamble.

2. Final Rule

This final rule requires actions to preclude WFD in transport category airplanes. It applies to both existing transport category airplanes that have a maximum takeoff gross weight greater than 75,000 pounds and to all transport category airplanes to be certified in the future, regardless of the maximum takeoff weight.

Today's rule imposes requirements on those holding design approvals for existing transport category airplanes that are subject to the rule. The design approval holders are required to evaluate the structural configuration of each model for which they hold a type certificate to determine its susceptibility to WFD and, if it is susceptible, to determine that WFD would not occur before the proposed LOV. The evaluation would be based on test evidence and analysis at a minimum and, if available, service experience or service experience and teardown inspection results of airplanes with a high number of total accumulated flight cycles or flight hours or both, which are frequently referred to as high-time airplanes. The evaluation would be performed on airplanes of similar structural design, accounting for differences in operating conditions and procedures. Using the results of the evaluation, the design approval holder must then establish an LOV.

Holders of approvals for design changes that increase an airplane's maximum takeoff gross weight to more than 75,000 pounds, or decrease it from more than 75,000 pounds to 75,000 pounds or less after the effective date of the rule, must also evaluate the affected airplanes for WFD and establish LOVs for those airplanes.

The final rule amends Appendix H to part 25 to require that the LOV which is established by the design approval holder be included in the Airworthiness Limitations section of the Instructions for Continued Airworthiness. It also amends operating rules in parts 121 and 129 to require that operators of an affected airplane incorporate into their maintenance programs an Airworthiness Limitations section that includes an LOV for that airplane.

The amendments to parts 121 and 129 have the effect of prohibiting operation of an airplane beyond its LOV. [14] For

[12] The group was initially known as the Airworthiness Assurance Task Force.

[13] Task 3.—Widespread Fatigue Damage (WFD) of Repairs, Alterations, and Modifications. Provide a written report providing recommendations on how best to enable part 121 and 129 certificate holders of airplanes with a maximum gross take-off weight of greater than 75,000 pounds to assess the WFD characteristics of structural repairs, alterations, and modifications as recommended in a previous ARAC tasking. The written report will include a proposed action plan to address and/or accomplish these recommendations including actions that should be addressed in Task 4 [below]. The report is to be submitted to the ARAC, Transport Airplane and Engine Issues Group, for approval. The ARAC, Transport Airplane and Engine Issues Group, will determine as appropriate the means by which the action plan will be implemented. The proposed actions and implementation process approved by the ARAC, Transport Airplane and Engine Issues Group, will be subject to FAA concurrence. Published in 69 FR 26641, May 13, 2004.

[14] Under 14 CFR 91.403(c), no person may operate an airplane unless applicable airworthiness limitations have been complied with. By requiring operators to incorporate the LOV airworthiness limitations developed by the design approval

Continued

transport airplane designs developed in the future, the LOV will be included in the airplane's airworthiness limitations and will apply regardless of how or by whom the airplane is operated. However, the final rule allows any person to extend the LOV for an airplane (if the person can demonstrate that it will be free of WFD up to the extended LOV) and to develop a maintenance program that supports the extended limit. Thereafter, the operator must incorporate the extended LOV and the associated maintenance actions into the Airworthiness Limitations section of its Instructions for Continued Airworthiness and may not operate the airplane beyond that limit.

The remainder of this section of the preamble discusses specific comments received.

B. Requests for Deferral or Withdrawal of Rule

The FAA received a number of comments that rulemaking to preclude WFD was not warranted and that the rule, as proposed, should be deferred or withdrawn. Commenters included United Parcel Service, American Airlines, FedEx, Cargo Airline Association (CAA), National Air Carrier Association (NACA), Lynden Air Cargo, ATA, Northwest Airlines, Transport Aircraft Technical Services, and Continental Airlines.

1. Safety Benefits Don't Justify Rule

American Airlines, ATA, and Lynden Air Cargo commented that the rule was not justified in terms of safety. They pointed out that there has been no catastrophic accident directly attributable to WFD since the Aloha Airlines accident in 1988 and that the National Transportation Safety Board found that WFD was a contributory factor, but not the sole factor, in that accident.

In contrast, Boeing commented that issuance of this final rule would cast a broad safety net on airframe structural performance for those types of details the industry has determined may be susceptible to WFD. Boeing said this final rule would provide for the establishment of safe operational limits and the maintenance actions necessary to preclude WFD prior to reaching those limits.

There have been several instances of major structural failure in flight due to fatigue. Therefore the potential for catastrophic structural failure is significant. The FAA considers that this rulemaking is essential to prevent future accidents or incidents. In the past, industry practice for new airplane design certification has been to develop some level of understanding of structural fatigue characteristics up to the design service goal, but not beyond it. A significant number of airplanes being operated currently have already accumulated a number of flight cycles or flight hours greater than the original design service goal. As the existing fleet continues to age, the number of such airplanes will increase. Structural fatigue characteristics of airplanes are understood only up to a certain point consistent with the analyses performed and the amount of testing accomplished. Operation beyond this point without further engineering evaluation should not be allowed because, in the absence of intervention, the likelihood of WFD increases with the airplane's time in service.

2. Existing Programs Serve Purpose of Rule

United Parcel Service, American Airlines, the CAA, ATA, Transport Aircraft Technical Services Company, and Lynden Air Cargo recommended that the proposed rule be withdrawn because existing programs serve the same purpose as an inspection program for WFD. These commenters were referring to existing elements of the Aging Aircraft Program, which resulted from the Aloha Airlines accident. They include the following:

- Supplemental Structural Inspection Program,
- Mandatory Modification Program,
- Repair Assessment Program,
- Corrosion Prevention and Control Program.

In addition, the FAA has issued airworthiness directives to address aging airplane safety concerns. Lynden Air Cargo and Transport Aircraft Technical Services Company said that the Aloha Airlines accident might not have happened if proper accomplishment and FAA oversight of the maintenance program had been performed.

The FAA recognizes that the four elements of the Aging Aircraft Program have some inherent ability to detect multiple site damage or multiple element damage, but existing inspection methods cannot detect such damage reliably. As acknowledged by some of the commenters, these four elements were not specifically designed to address WFD; they were designed as elements of an overall program to address structural degradation on the pre-Amendment 25–45 airplanes over 75,000 pounds maximum takeoff gross weight, commonly known as the "elite eleven." [15] This final rule, which specifically addresses WFD, is intended to be the last element of the overall Aging Aircraft Program.

The AAWG, of which several of these commenters were members, recognized the inadequacy of existing programs to address WFD when it submitted its recommendation for FAA rulemaking on this subject in 2001. The recommendation included the following discussion:

> Regulatory and industry experts agree that, as the transport airplane fleet continues to age, eventually WFD is inevitable. Long-term reliance on existing maintenance programs, even those that incorporate the latest mandatory changes introduced to combat aging, creates an unacceptable risk of age-related accidents. Even with the existing aging airplane program for large transports in place, WFD can and does occur in the fleet. Therefore, the FAA has determined that, at a certain point of an airplane's life, the existing aging airplane program is not sufficient to ensure the continued airworthiness of that fleet of airplanes.

As discussed previously, the FAA has issued approximately 100 airworthiness directives to address unsafe conditions due to WFD on a number of airplanes. Airworthiness directives are reactive in the sense that the agency issues them only after determining that an unsafe condition exists in one or more airplanes and is likely to exist or to develop in other airplanes of the same type design. Typically, unsafe conditions associated with WFD or its precursors have been discovered largely by chance by people performing unrelated airplane maintenance.

The FAA concludes that the agency cannot rely on existing programs—including issuing airworthiness directives if the FAA learns of an unsafe condition—to detect or address WFD that occurs in aging airplanes. These programs do not obviate the need for a rule to prevent catastrophic accidents due to WFD. This final rule specifically addresses WFD and its precursors by requiring design approval holders to evaluate their airplanes for WFD to prevent development of unsafe conditions.

Although maintenance program oversight can always be improved, the

holders under this rule, this final rule makes those LOVs applicable to the affected airplanes, and § 91.403(c) requires operators to comply with them.

[15] The elite eleven are the original models considered under the Aging Aircraft Program. These were airplanes over 75,000 pounds, operating under part 121 or 129, that were at a greater risk for age-related structural problems because they had high-time airplanes that were near or over their design service goals. They include the Airbus A300, Boeing 707/720, Boeing 727, certain Boeing 737s, certain Boeing 747s, McDonald Douglas DC–8, DC–9/MD–80, and DC–10, Lockheed L–1011, Fokker F–28, and the BAC 1–11.

fact remains that WFD is difficult, if not impossible, to detect. Small cracks that can lead to WFD often cannot be detected until they suddenly increase in size and "link up," to cause catastrophic damage. Dramatic crack growth can occur quite suddenly and quickly, after being undetectable for long periods of time. That is why maintenance inspections cannot be relied on to detect and repair such cracking. Airplane maintenance programs include inspections that are designed to detect obvious damage and irregularities. WFD, by its nature, is usually hidden, and not readily detectable. Discovery of WFD in some airplanes by mechanics has been a purely random occurrence, where damage detected was the result of WFD that had progressed to the point of failure of structural members. An example is discovery of WFD on a Boeing 747, with adjacent frame cracking and separations. It was detected because of loose rivets on the skin. Mechanics happened upon the WFD damage by chance, because inspections had not uncovered any problem. Improving a maintenance program by adding or modifying inspections would not necessarily have the effect of improving detection of WFD. In general, the only way to address WFD is by modifying or replacing structure.

The National Transportation Safety Board report stated the following:

> It is probable that numerous small fatigue cracks in the lap joint along S–10L joined to form a large crack (or cracks) similar to the crack at S–10L that a passenger saw when boarding the accident flight. The damage discovered on the accident airplane, damage on other airplanes in the Aloha Airlines fleet, fatigue striation growth rates, and the service history of the B–737 lap joint disbond problem led the Safety Board to conclude that, at the time of the accident, numerous fatigue cracks in the fuselage skin lap joint along the S–10L linked up quickly to cause catastrophic failure of the large section of the fuselage.

The AAWG worked on various solutions to the safety problems encountered by aging airplanes and was instrumental in developing the four programs listed earlier in this document. However, they decided that additional actions were needed to preclude WFD in airplanes, and the steps they outlined included:

- Setting limits of validity of the maintenance program.
- Deciding whether WFD can be inspected for, and, if so, for how long such inspections would be effective.
- Defining when WFD-susceptible structure should be modified or replaced.

Lynden Air Cargo stated that it supported an approach that used airworthiness directives to address WFD-susceptible structural components instead of an LOV approach for the entire airplane. Lynden Air Cargo further stated that the unique design of the L–382G allows for the whole airframe to be renewed by replacing WFD-susceptible sections (*e.g.,* center wing and outer wing).

The FAA agrees with Lynden Air Cargo that WFD-susceptible structure can be replaced when the engineering data determines it should be replaced to preclude WFD. However, as airplanes age, other areas may also need to be replaced. The only way to determine that is to evaluate the engineering data (analyses, tests, service experience) for the entire airplane. Without the LOV, the operational life of an airplane is undefined. As a result, the list of areas to inspect, modify, replace, or any combination of these may be extensive, since the data would need to substantiate an indefinite life.

3. Divide Rule into Two

FedEx, Northwest Airlines, Continental Airlines, NACA, and ATA stated that the proposed draft final rule does not allow the public an opportunity to comment on the LOVs that design approval holders propose as compliance to part 26. They suggested the rule be divided into two rules: one for design approval holders and one for operators. The commenters noted that this two-step process would provide the public the opportunity to comment on design approval holders' proposed LOVs. Deferral of the operator rule would also allow for public comment on the WFD maintenance actions at the same time LOVs are established. In support of this approach, FedEx specifically argued that the incremental costs for the part 26 work to design approval holders is minimal, as design approval holders have confirmed in their comments to this docket.

The FAA has determined that complementary, concurrent requirements for design approval holders and operators are necessary to achieve the safety benefits of the proposed rule in a timely manner. Although design approval holders would be required to develop LOVs for affected airplanes under part 26, the safety benefit for this rulemaking initiative is not met until operators incorporate LOVs and only operate airplanes up to the point in time for which it can be shown that the airplane will be free from WFD. Until design approval holders actually comply with part 26, it's not possible to identify the precise LOV for any particular airplane. However, operators have had adequate general notice of the objectives of this rulemaking and the proposed methods for achieving those objectives in the form of the design approval holders' anticipated LOVs. Since the public meeting, both Boeing and Airbus have provided revised information about where they anticipate those LOVs will be set.

If additional, multiple rulemakings are necessary to require operators to incorporate LOVs into their maintenance programs, there is a risk of airplanes exceeding LOVs before those rules become effective. The FAA concludes that, to achieve our safety objectives, design approval holders and operators must have a shared responsibility on certain safety issues affecting the existing fleet. We also conclude, from reviews such as the Commercial Airplane Certification Process Study (March 2002), that we need to facilitate more effective communication of safety information between design approval holders and operators. As both technology and airworthiness issues become more complex, certain fleet-wide safety issues require the FAA to implement complementary requirements for design approval holders and operators, when appropriate.

C. Concept of Operational Limits

This final rule requires design approval holders to establish limits of validity of the engineering data that supports the maintenance program. The proposed rule would have required that design approval holders establish initial operational limits beyond which airplanes may not be operated. The initial operational limit would be based on the demonstration of freedom from WFD up to that initial operational limit.

Several commenters supported the concept of early detection of WFD for aging airplanes but opposed the requirement to establish initial operational limits beyond which the airplanes could not be operated. These commenters equated establishment of such limits with mandatory retirement of airplanes and suggested that, instead, the FAA enhance current maintenance programs and practices.

1. Requests for Requiring Maintenance Programs Instead

An aircraft leasing and trading company named AWAS recommended that an inspection-based maintenance program become mandatory as airplanes reach their design service goal or their operational limit. Lynden Air Cargo stated that there are better, less intrusive methods to achieve early detection of WFD than the "application of onerous initial and extended operational limits." According to the commenter, these methods include proper establishment, accomplishment, and enforcement of current airplane maintenance programs, such as the maintenance programs required by parts 121 and 135. Lynden Air Cargo said it is continuously revising its Continuous Airworthiness Maintenance Program to include a design approval holder inspection program of Structural Significant Items and recommended structural service bulletins.

These commenters raise some of the same issues as did those who opposed the rule altogether. They suggest that current programs for aging airplanes or new maintenance programs to detect WFD—along with issuance of airworthiness directives when WFD is detected—would obviate the need for setting operational limits.

As stated in the NPRM, the structural fatigue characteristics of airplanes are only understood up to a point in time consistent with the analyses performed and amount of testing accomplished. Structural maintenance programs are designed with this in mind. The LOV is defined as the limit of the engineering data that supports the structural maintenance program and the current regulatory maintenance requirements of parts 121 and 129 do not require that WFD be specifically addressed.

Also as discussed previously, WFD cannot be detected reliably by existing inspection methods. Therefore, the FAA considers that WFD in existing airplanes needs to be proactively addressed by requiring design approval holders to use relevant engineering data to project the number of flight cycles or flight hours or both which the airplanes can accumulate without incurring WFD. The engineering data may include the evaluation and establishment of maintenance actions that address WFD.

2. Single Retirement Point for a Model

The Modification and Replacement Parts Association (MARPA) opposed a single, mandatory retirement age for airplanes because of the "vast differences possible between aircraft models, missions, and maintenance." In a similar vein, a company named Safair, which is based in South Africa, commented that the difference in structural integrity of aging airframes lies in their use and abuse during their lives and is largely dependent on the specific load factors to which the airframe is subjected. Safair added that the proposed rule may be based on inadequate technical evaluation of the actual operational experience, considering the number of older aircraft that have been safely operated well beyond the actual cycles listed in the proposed rule.

It is true that there may be differences between airplanes of the same model which reflect differences in use and maintenance by different operators. When manufacturers design an airplane, they consider the various ways it may be used, and they develop a "mission profile" to account for the different loads the airplane may be subjected to that must be addressed in their design. In setting the LOV, manufacturers will take this information into account, along with service experience of the particular airplane model and fatigue test evidence. The LOV must apply to an airplane model, because it is based on analysis of the service experience of the entire fleet of affected airplanes.

3. Potentially Adverse Effect on Safety

Lynden Air Cargo, MARPA, and the airplane leasing and trading company AWAS also suggested that mandatory retirement of airplanes may have an adverse effect on safety which has not been considered by the FAA. Specifically, AWAS envisioned that operators of airplanes approaching their operational limit may perform minimal maintenance on airframes to save money. MARPA said that mandatory retirement could have a negative influence on the degree and timing of safety-related investment, particularly as the aircraft nears its "throwaway years." The owner and operator may not intend to be unsafe, suggested MARPA, but the question "Why invest now?" will arise. A similar comment from Lynden Air Cargo anticipated that operators "are unlikely to apply the same level of maintenance effort for an airplane 1,000 flight hours from the scrap heap as one with 20,000 flight hours remaining."

Under existing operating rules, operators are responsible for maintaining their airplanes in an airworthy condition. These maintenance requirements apply equally to new and old airplanes. Even without this final rule, operators have always planned to retire airplanes, and service experience indicates that they generally continue to maintain them safely up to that point. The purpose of this final rule is to ensure that airplanes are retired before the point where they can no longer be safely maintained with respect to WFD.

D. Change in Terminology (Initial Operational Limit to LOV)

1. Rationale for the Term LOV

The NPRM proposed to establish an initial operational limit, expressed in flight cycles, flight hours, or both, beyond which an airplane could not be operated. Several commenters, including industry representatives on the AAWG and Boeing, objected to this term and suggested that instead the FAA refer to the "limit of validity of the engineering data that supports the maintenance program," or LOV. This final rule uses the term LOV to express the point beyond which an airplane cannot be operated (unless an extended LOV has been approved).

In recommending that the FAA refer to the "limit of validity of the engineering data that supports the maintenance program," or LOV, industry representatives on the AAWG stated that the term "initial operational limit" implies that the use of an airplane is limited in operation. According to the commenters, the limitation is actually based on the engineering knowledge of the structural behavior of the airplane model and is intended to ensure that required inspections are sufficient to ensure safe operations until a certain number of flight cycles or flight hours or both have been reached. The engineering data that support such inspection requirements change with time due to knowledge gained from in-service experience and additional testing.

Boeing defined LOV as the point (usually measured in flight cycles) in the structural life of an airplane where the engineering basis for the maintenance actions contained in the Airworthiness Limitations section of the Instructions for Continued Airworthiness is no longer a valid predictor of future structural behavior.

Our intent, as stated in the NPRM, was to ensure that large transport category airplanes not be operated beyond their initial operational limit, unless operators had incorporated an extended operational limit and the service information necessary to support it into their maintenance programs. Just as the structural fatigue characteristics of airplanes are understood only up to a point consistent with analyses performed, testing accomplished, and in-service experience gained, the engineering data used to develop inspections and modifications to preclude WFD is valid only to a certain point.

For these reasons, the FAA finds the term "limit of validity" more appropriate than the term "initial operational limit" in defining the point to which an airplane may be safely operated in relation to WFD. The LOV is substantiated by test evidence and analysis. This test evidence and analysis may be augmented by service experience, or by service experience and teardown inspection results, if available. The service experience and teardown inspection results must be for high-time airplanes of similar structural design, accounting for differences in operating conditions and procedures. Additional engineering data would be necessary to support operation of an airplane beyond the LOV. The legal effect of the terms initial operational limit and limit of validity is the same. Therefore, this final rule uses the term limit of validity instead of the term initial operational limit.

2. Refer to the Structural Maintenance Program

Airbus stated that the term limit of validity of the engineering data that supports the maintenance program should be revised for clarification. Because WFD is addressed by performing inspections or modifications or replacements of airframe structure, the phrase "maintenance program" should be changed to "structural maintenance program."

The FAA agrees with Airbus and that change is reflected here.

E. Repairs, Alterations, and Modifications

This final rule requires design approval holders to establish LOVs for airplane models subject to this rule. However, it does not include separate requirements to address WFD for repairs, alterations, and modifications to those airplanes or to develop guidelines to address repairs, alterations, or modifications. The proposed rule would have required evaluation of repairs, alterations, and modifications of the baseline structure of the airplane. The proposed rule would have also required development of guidelines for repairs, alterations, and modifications. Persons repairing or altering airplanes certified to § 25.571 at Amendment 25–96 or later are already required to show the repair or alteration to be free from WFD up to the airplane's design service goal. This requirement has not changed since adoption of Amendment 25–96 in 1998.[16]

1. Whether Repairs, Alterations, and Modifications Pose WFD Risks

The Technical Document, discussed earlier, stated that the FAA, in response to comments, had removed the proposed requirements for repairs, alterations, and modifications. In response to the Technical Document, Lynden Air Cargo, Northwest Airlines, ATA, Continental Airlines, and FedEx stated that they support removal of requirements for repairs, alterations, and modifications from the draft final rule. These commenters stated that repairs, alterations, and modifications present a reduced risk for WFD because they will be surveyed and assessed under the Aging Airplane Safety Final Rule and the Damage Tolerance Data for Repairs and Alterations Rule (hereafter referred to as the Damage Tolerance Data Rule).[17] Commenters often used the term "Aging Airplane Safety Rule" to refer to the Damage Tolerance Data Rule or the Aging Airplane Safety Final Rule, or both. In instances where this occurs, to avoid confusion, the name of the specific rule has been inserted in parentheses.

These commenters expressed the belief that a new WFD requirement for repairs, alterations, and modifications is unnecessary because of these other requirements, which are already in place. Lynden Air Cargo stated that, although it supports removal of requirements to evaluate repairs, alterations, and modifications for WFD because the Damage Tolerance Data Rule already adequately addresses them, it does not understand how each design approval holder is going to establish the validity of its maintenance program without validating the repairs and alterations it has established under that program. Northwest Airlines said that it supported the conclusion of the AAWG that the costs of including repairs, alterations, and modifications in the rule outweighed the benefits that such a requirement would have.

Boeing, Airbus, and the European Aviation Safety Agency (EASA) said the FAA should reconsider its decision to remove from the rule the requirements for evaluating certain repairs, alterations, and modifications. All three commenters stated that removing those requirements could affect safety because certain alterations could affect the LOV and the structural maintenance program that supports the LOV. An example of an alteration that could affect the LOV and structural maintenance program, the commenter maintained, is one that would cause a global loading increase, such as an alteration allowing a higher cabin differential pressure. Airbus stated that, although the Changed Product Rule (14 CFR 21.101) may address future alterations and modifications, it does not cover existing ones.

Boeing recommended that the FAA revise subpart E of part 26, the Damage Tolerance Data Rule, for repairs and alterations, and §§ 121.1109 and 129.109, the Aging Airplane Safety Final Rule, to include requirements for evaluating repairs, alterations, and modifications for WFD. Boeing's recommendation contains two parts. First, it requests that the FAA extend the compliance date for both rules by 18 months after the effective date of the WFD rule. Second, it says the FAA should incorporate the 2007 ARAC recommendations on evaluating repairs, alterations, and modifications into those rules.

Boeing, Airbus, EASA, and the Allied Pilots Association (APA) stated that *certain* repairs, alterations, and modifications need to be evaluated for WFD. APA stated that eliminating the requirement to evaluate WFD associated with most repairs, alterations and modifications from the final rule is risky, because many high-time airplanes fall into this category and will not have any current analysis done on their modified airframes.

In its final report to ARAC concerning Task No. 3, the AAWG stated that it has reviewed the accident record and has observed that—while there is a technical possibility of a WFD-related accident involving a repair or alteration—there are no recorded accidents attributed to WFD occurring in properly-installed repairs or alterations. The group added that a review of certain repairs, alterations, and modifications is necessary, because some of them have the potential to develop WFD.

The FAA agrees with the commenters that some repairs, alterations, and modifications may pose a risk of developing WFD. However, the risk appears to be less than that for baseline airplane structure because all adverse service experience to date has been limited to baseline airplane structure. Type certificate holders design repairs, alterations, and modifications using the same design philosophies and load cases as for baseline airplane structure. As they do with the baseline airplane structure, type certificate holders re-evaluate their repairs, alterations, and modifications as service experience is gained. Therefore, these repairs, alterations, and modifications should be acceptable up to the LOV.

The repairs, alterations, and modifications developed by persons other than type certificate holders may present a slightly greater risk, because those persons typically do not have the

[16] March 31, 1998, 63 FR 15708.

[17] 72 FR 70486, December 12, 2007.

type certificate holder's data or expertise. Although those repairs, alterations, and modifications may pose a higher risk for developing WFD, there are no recorded accidents attributed to WFD occurring in these repairs, alterations, and modifications. Nor have there been a significant number of findings of multiple site or element damage associated with them.

The FAA is funding additional research at the agency's Technical Center to get a better understanding of these risks and how to address them.[18] This research includes conducting a field survey of repairs, alterations, and modifications on high-time airplanes to document the existing configurations. The research also includes removing some repairs, alterations, and modifications to further evaluate their condition. In some cases, testing of particular structure may be performed to obtain data for calibration and validation of methodologies for predicting WFD. If this research demonstrates that additional actions are needed to address risks for repairs, alterations, and modifications, the FAA will consider further rulemaking.

Based on the above, the FAA has re-evaluated the NPRM and determined that the proposed requirements to address repairs, alterations, and modifications should be removed from the final rule.

2. Relationship to Damage Tolerance Requirements (§ 25.571)

a. Pre-Amendment 25–96 Airplanes

The FAA received numerous comments requesting that the proposed requirements for repairs, alterations, and modifications in the NPRM and the related proposed requirements of the Damage Tolerance Data Rule NPRM[19] be combined and aligned in a single rulemaking. These commenters included industry representatives who are members of the AAWG,[20] the ATA, Boeing, Airbus, Cessna, and American Airlines. They were concerned that separate requirements for repairs, alterations, and modifications in the Aging Airplane Safety Rule (the Damage Tolerance Data Rule) and the NPRM for this rule would require duplicative efforts.

Given the proposed timeframes for compliance and the shortage of qualified industry resources to perform the required analyses, the commenters suggested that separate requirements are unnecessary and could not be accomplished within the proposed compliance times. The industry representatives on the AAWG stated that there are fewer than 50 persons in industry who are qualified to perform damage tolerance and WFD assessments and most of them are employed by the major design approval holders.

The AAWG stated in its final report on Task 3 that existing alterations and repairs would receive a damage tolerance assessment under the Aging Airplane Safety Final Rule (developed under the Damage Tolerance Data Rule).[21] The report indicated that this should provide an improved level of safety because repairs, alterations, and modifications would be surveyed and evaluated. The AAWG recommended that repairs not be re-reviewed for WFD if they had already been reviewed for damage tolerance.

Since adoption of Amendment 25–45 in 1978,[22] the damage tolerance provisions of § 25.571 have required consideration of damage at multiple sites, the precursor for WFD. While recent efforts on damage tolerance have focused on localized cracking, in most cases the design approval holders have addressed multiple site damage in their design of both baseline structure and of repairs, alterations, and modifications, even if indirectly. As a result, the FAA agrees that damage tolerance assessment of repairs, alterations, and modifications should provide some degree of mitigation of risk, even though the focus of the assessments has been on developing inspections, and inspections cannot reliably detect WFD.

The FAA recognizes the scarcity of expert resources in the area of damage tolerance and WFD. By removing requirements to address repairs, alterations, and modifications from this final rule, the agency is allowing those resources to be focused on meeting the compliance dates for the Damage Tolerance Data Rule and addressing WFD in baseline airplane structure, where the risks are greater. The FAA has recently been providing training to its designees and to industry members regarding compliance with § 25.571 and the Damage Tolerance Data and Aging Airplane Safety Final Rules. In that training, we have provided additional guidance on performing a damage-tolerance evaluation to assess damage at multiple sites. Adoption of this final rule should also result in significant commitments from industry to develop resources with this expertise.

b. Airplanes Certified to Amendment 25–96 or Later

The Technical Document described the agency's intent to remove requirements for evaluating repairs, alterations, and modifications for WFD. Airbus requested that the FAA clarify that today's final rule will not negate those requirements for persons making repairs, alterations, or modifications to their airplanes certified to Amendment 25–96. As another option, Airbus requested that the WFD rule applicability not include Amendment 25–96 or later airplanes, because those airplanes are already certified to WFD requirements.

The FAA agrees that clarification is necessary for airplanes certified to § 25.571, Amendment 25–96 or later. Amendment 25–96 revised § 25.571 to require that full-scale fatigue test evidence[23] be developed to show freedom from WFD up to an airplane model's design service goal. Also, any person performing a repair, alteration, or modification to those airplanes must address WFD for the repair, alteration, or modification, and show compliance with those requirements. The newest airplanes, like the Airbus A–380, are certified to Amendment 25–96, but most other airplanes operating today are certified to an Amendment level prior to 25–96, and thus would not be required to comply with those WFD requirements. They would, however, be required to comply with the requirements of the Damage Tolerance Data Rule.

For today's rule, § 25.571 and Appendix H to Part 25 require that applicants show an airplane model to be free from WFD up to the LOV instead of to the design service goal. Unlike Amendment 25–96, which did not require the design service goal to be included in the Airworthiness Limitations section, this final rule mandates LOV placement in the Airworthiness Limitations section. The

[18] Task Area II, Project I, Survey of Transport Airplane Structural Repairs and Alterations, Statement of Work 064070723–1, dated October 23, 2007; FAA William J. Hughes Technical Center, Atlantic City, New Jersey. The Scope of Work for this research is available in the docket for this rule.

[19] 71 FR 20574, April 21, 2006.

[20] The companies represented are Boeing, Airbus, American Airlines, Northwest Airlines, US Airways, United Parcel Service, FedEx, ABX (previously known as Airborne Express), Continental Airlines, Japan Air Lines, United Airlines, and British Airways. Although the comments are not representative of the views of other members of the AAWG, including national authorities, for simplicity the source of these comments is identified hereafter as "industry representatives on the AAWG."

[21] The Damage Tolerance Data Rule is Amendment 26–1 and the Aging Airplane Safety Final Rule is Amendment 121–337 to the CFR.

[22] October 5, 1978, 43 FR 46238.

[23] Test evidence comprises full fatigue testing up to at least two times the proposed design service goal and may include, for derivative airplanes, analysis, service experience, or service experience and results of tear-down inspections of high-time airplanes, if available.

requirements of today's rule are similar to those of Amendment 25–96. Any person who repairs, alters, or modifies any airplane certified under today's rule must show that repair, alteration, or modification to be free from WFD up to the airplane's LOV.

3. Guidelines for Repairs, Alterations, and Modifications

Industry representatives on the AAWG and several other commenters recommended that proposed § 25.1807(g), along with §§ 25.1809 and 25.1813, be withheld until the working group completed relevant taskings from ARAC. In particular, the commenters stated that the guidelines in § 25.1807(g)(3) could not be technically accomplished because the design approval holders do not have the data or knowledge necessary to provide guidance for all possible repair or alteration configurations.

Boeing and Airbus commented that they could support WFD guidelines that are limited in scope. The guidelines should identify structure prone to development of WFD and provide processes and procedures by which operators can access valid data for complying with the rule. But these commenters said that such guidelines should not attempt to describe methods for determining when WFD is likely to occur or for developing service information to preclude WFD. The commenters objected to providing guidelines as defined under proposed § 25.1807(g)(3) because design approval holders would have no control over how the guidelines would be used. They further stated that such guidelines could expose design approval holders to potential liability if they are applied incorrectly.

When the FAA issued the NPRM, the agency was relying on the AAWG, under an ARAC tasking, to identify a means of compliance that would be practical for both design approval holders and operators. Although ARAC did not provide detailed recommendations for developing guidelines, it did provide a general approach.

Requirements pertaining to repairs, alterations, and modifications were included in the proposed rule to ensure that they would not degrade the level of safety provided by the design approval holder's compliance with the rule. Although the FAA has removed these proposed requirements from the final rule, the agency is engaged with industry in a number of activities to address these concerns.

For repairs, the AAWG recommended in its final report on Task 3 that each design approval holder update its publications (*e.g.,* structural repair manuals, service bulletins, and repair assessment guidelines) to include instructions for inspecting and, if necessary, modifying structure susceptible to WFD. This update should occur by the time the design approval holder has established the LOV for an airplane model. The AAWG recommended that design approval holders update their service documents for WFD at the same time they are revising these documents for the Aging Airplane Safety Rule (the Damage Tolerance Data Rule) if the WFD data are available. The FAA expects that design approval holders will fulfill this recommendation. To the extent that design approval holders update their service documents for WFD, operators, when complying with requirements of the Aging Airplane Safety Final Rule by using those updated service documents for repairs, will be addressing the WFD risks for these repairs. In addition, § 25.571 already requires consideration of the potential for WFD for repairs to airplanes certified to Amendment 25–96 or later.

For alterations, the AAWG surveyed 642 supplemental type certificates. Out of the 642, they identified only 14 alterations and modifications that would require assessment for WFD. Based on this, they suggested that the FAA review these types of existing alterations to determine whether any action is necessary. The Task 3 report did not specifically recommend that design approval holders address their alterations for WFD. However, recent meetings conducted by certain design approval holders indicate that they intend to address their own alterations and modifications for WFD in addition to repairs in the Task 4 [24] structures task group activity. The majority of transport airplanes operating in the U.S. that are subject to this final rule will be addressed by these design approval holders. We anticipate that other design approval holders will also review their alterations and modifications for WFD.

While these activities will not address alterations and modifications developed by other persons (including supplemental type certificate holders), as stated earlier, the FAA is conducting research to get a better understanding of the risks that repairs, alterations, and modifications may pose for developing WFD and whether they need to be assessed for WFD. If the FAA determines that the risks are unacceptable, the FAA will consider further rulemaking to mandate assessments.

This research may also assist in refining means of compliance with § 25.571, at Amendment 25–96 or later, for repairs, alterations, and modifications. For airplanes certified to Amendment 25–96 or later, persons who repair or alter the airplane must address WFD. This has typically been done by showing the repair or alteration to be adequate up to the airplane's design service goal. With adoption of this final rule, repairs, alterations, and modifications to airplanes designed in the future will have to be shown to be free from WFD up to the airplane's LOV.

4. Rely on the Changed Product Rule

Northwest Airlines stated that it supports the FAA in removing WFD requirements for most repairs, alterations, and modifications, but requested that references to future alterations be removed from the final rule and addressed by the Changed Product Rule, 14 CFR 21.101. The Changed Product Rule requires that significant changes to type-certificated products comply with the latest amendments of the airworthiness standards unless one of the stated exceptions applies. In support of its position, Northwest Airlines cited concerns published by the AAWG about industry not having the resources or sufficient FAA guidance to accomplish WFD analysis for the expected quantities of supplemental type certificate alterations.

Similarly, ATA stated that in view of their coverage under the Changed Product Rule, the FAA should exclude future supplemental type certificate applications from the applicability of this rule. Northwest Airlines and ATA requested that the FAA use the Changed Product Rule to regulate which future alterations would need to be evaluated for WFD.

The Changed Product Rule would require applicants for future alterations and modifications to include the latest

[24] Task 4.—Model Specific Programs.

Oversee the Structural Task Group (STG) activities that will be coordinated for each applicable airplane model by the respective type certificate holders and part 121 and 129 certificate holders. These STG activities will involve the development of model specific approaches for compliance with §§ 121.370a and 129.16 under the guidance material supplied in Task 1. As part of this tasking, the AAWG will identify those airplane models that do not have an STG, and will assess the need to form one (based on industry benefit). For those airplane models that will need to form an STG, the AAWG will initiate the coordination required to form the STG with the respective type certificate holder and/or part 121 and 129 certificate holders. In addition, the AAWG will support implementation of the action plan to address recommendations made in tasks 2 and 3 as determined necessary by the ARAC, Transport Airplane and Engine Issues Group, and concurred with by the FAA.

amendment of part 25 for § 25.571 in the certification basis for the proposed alteration or modification if the change is considered significant. For the purposes of today's rule, applicants would use the examples of significant changes identified in AC 21.101–1. For transport category airplanes, that AC may be used as a starting point for determining whether alterations or modifications are significant and must be evaluated to the latest amendment of § 25.571. Examples of significant changes from AC 21.101–1 that would be required to be assessed for WFD include passenger-to-cargo conversions, gross weight increases, and cabin pressure increases. We have revised AC 25.571–1X to provide additional guidance for identifying whether a change, or structure affected by the change, requires an assessment for WFD. Affected structure can be new structure installed by the change or existing structure modified by a change. Structure may be affected if it is physically changed or if there is a change or redistribution of internal loads. The long-term result will be that a changed product will have a certification basis that provides a similar level of safety to that provided by the certification basis of a new type certificate for the same product.

F. Compliance Times for Developing and Implementing LOVs

For existing airplanes, this final rule uses a phased approach for establishing LOVs and divides the compliance dates for holders of design approvals and applicable airplane models into three groups. The NPRM proposed that design approval holders establish LOVs for all affected airplanes by one specific date. The proposed rule did not account for the age of airplanes within a model.

For this final rule, the compliance dates for the different airplane groups are identified based on their certification basis relative to § 25.571 and are as follows:

- *Group I:* Pre-Amendment 25–45 airplanes (those with a certification basis dating before 1978). The Boeing 727 and the Airbus A300 are examples of pre-Amendment 25–45 airplanes.
- *Group II:* Amendment 25–45 up to but not including Amendment 25–96 airplanes (those with a certification basis dating from 1978 to 1998). This group of airplanes would include the Boeing 757 and 767 and the Airbus A318.
- *Group III:* Amendment 25–96 and later airplanes (those with a certification basis dating from 1998 to the present). The Airbus A380 and the Embraer ERJ 170 and 190 are among the airplanes that have this certification basis.

Table 1 in § 26.21 indicates the compliance times for these various groups of airplanes. They are 18, 48, and 60 months, respectively. These compliance times apply to all existing versions of these airplane models.

For airplane models for which a type certificate is approved as of the effective date, but which are not specifically named in Table 1 of § 26.21, an LOV must be established within 60 months after the effective date of the rule. In Table 1 of § 26.21, those airplanes would fall under the category of "All Other Airplane Models Listed on a Type Certificate as of January 14, 2011."

For type certificate or amended type certificate approvals that are pending as of this final rule's effective date, and for future amendments to existing or pending type certificates, this final rule requires the applicants to establish an LOV by the latest of the following dates:

- Within 60 months after the effective date of the rule,
- The date a certificate is issued, or
- The date specified in the plan approved under § 25.571(b) indicating when the full-scale fatigue testing and evaluation will be complete.

This final rule requires operators to incorporate the Airworthiness Limitations section that includes the LOV into their maintenance program within 30, 60, or 72 months after the effective date for Groups I, II, and III, respectively. Table 1 in §§ 121.1115 and 129.115 gives the compliance times for operators.

This final rule also requires operators of affected airplanes whose applications for type certificates or amended type certificates are pending as of the effective date, or whose application for a type certificate or amended type certificate is made after the effective date of the rule, to incorporate the Airworthiness Limitations section that includes the LOV into their maintenance program at the latest of the following compliance times:

- Within 72 months after the effective date of the rule,
- Within 12 months after the LOV is approved, or
- Before operating the airplane.

In Table 1 of § 121.1115 and § 129.115, those airplanes would fall under the category of "All Other Airplane Models (TCs and Amended TCs) not Listed in Table 2."

Amended or supplemental type certificates that change the maximum takeoff gross weight are grouped separately. Holders of amended type certificates or supplemental type certificates that increase the maximum takeoff gross weight to greater than 75,000 pounds, regardless of whether such change was applied for before or after the effective date of the rule, must comply within 18 months after the effective date of the rule. Applicants for this type of design change approval whose applications are either pending as of the effective date of this final rule or submitted after the effective date must comply by the latest of the following dates:

- Within 18 months after the effective date of the rule,
- The date the approval is issued, or
- The date specified in the plan approved under § 25.571(b) indicating when the full-scale fatigue testing and evaluation will be complete.

Applicants for amended type certificates or supplemental type certificates applied for after the effective date of the rule that decrease the maximum takeoff gross weight to 75,000 pounds or less must also comply by the latest of the following dates:

- Within 18 months after the effective date of the rule,
- The date the certificate is issued, or
- The date specified in the plan approved under § 25.571(b) indicating when the full-scale fatigue testing and evaluation will be complete.

This final rule requires operators of airplanes whose maximum takeoff gross weight was decreased to 75,000 pounds or below after the effective date of the rule or increased to greater than 75,000 pounds at any time by an amended type certificate or supplemental type certificate to incorporate the Airworthiness Limitations section that includes the LOV into their maintenance program by the latest of the following compliance times:

- Within 30 months after the effective date of the rule,
- Within 12 months after the LOV is approved, or
- Before operating the airplane.

Those airplanes would fall under the category of "Maximum Takeoff Gross Weight Changes" in Table 1 of § 121.1115 and § 129.115.

Under 14 CFR 91.403(c), no person may operate an airplane unless that person is in compliance with applicable airworthiness limitations. By requiring operators to incorporate the Airworthiness Limitations Section containing the LOV into the maintenance program, this final rule makes those LOVs applicable to the affected airplanes, and § 91.403(c) requires operators to comply with them.

Operators of airplanes whose type certificate was pending approval as of the effective date of the rule will be required to include one of the following airworthiness limitations in their maintenance program:

- The LOV that has been specified in the Airworthiness Limitations section of the Instructions for Continued Airworthiness; or
- If the LOV has not yet been established, a number equal to ½ the number of cycles accumulated on the fatigue test article if a type certificate is issued prior to completion of full-scale fatigue testing.

Comments received during the NPRM comment period were responding to the one specific compliance date published in the NPRM. Comments received during the comment period for the Technical Document, which described changes that had occurred to the rule since it had been proposed in the NPRM, were in response to the phased compliance dates published in the Technical Document, which are the dates cited in today's rule.

1. NPRM Compliance Date

Commenters—including industry representatives on the AAWG, Cessna, Continental Airlines, Embraer, AWAS, the CAA, American Airlines, Boeing, Airbus, and FedEx—objected to the proposed compliance date of December 18, 2007, for both technical and practical reasons. Several commenters stated that hard compliance dates and an expected final rule issuance in December 2006 would leave design approval holders with less than 12 months to comply with the subpart I requirements (now part 26). These commenters requested that the FAA revise the compliance dates to represent a number of months after the effective date of the rule rather than a hard date. This approach would prevent the FAA's schedule for issuing the final rule from affecting compliance by design approval holders.

We have revised the compliance dates in this final rule to specify that persons must comply either by a date determined as a specified number of months after the effective date of the final rule or (for applicants) by the date of approval of the related certificate.

2. When to Set LOVs for Existing Airplanes

Industry representatives on the AAWG, Boeing, Continental Airlines, Northwest Airlines, ATA, Lynden Air Cargo, and FedEx stated that there should be a phased approach to setting LOVs, with the oldest airplane models being addressed first. The industry representatives on the AAWG suggested that existing airplane models subject to the rule be divided into two groups: (1) Pre-Amendment 25–45 airplanes and (2) airplanes certified to Amendment 25–45 or later. The commenters stated that performing WFD evaluations on airplane models before the high-time airplane reaches its design service goal, as proposed in § 25.1807 (now § 26.21) and as specified in the Technical Document, would not significantly increase operational safety. This is because WFD is typically not a concern until later in an airplane's operational life. As discussed earlier, these commenters objected to the proposed compliance date of December 18, 2007. Commenters also objected to the compliance times identified in the Technical Document—that is, 18 months for pre-Amendment 25–45 airplanes, 48 months for Amendment 25–45 up to but not including Amendment 25–96 airplanes, and 60 months for Amendment 25–96 airplanes.

Boeing said that the final rule should provide the greatest amount of time for design approval holders to develop LOVs, so that LOVs provide the greatest flexibility for the fleet. Several commenters argued that requiring compliance prior to or concurrent with the Aging Airplane Safety Rule (Damage Tolerance Data Rule) would not be practical because of limited industry and FAA resources. In addition, Boeing and Northwest Airlines argued that establishing an LOV for an airplane model before significant service experience had been accumulated would result in an erroneous LOV.

We agree that it makes sense to have compliance dates for establishing LOVs for existing airplanes based on the relative safety risk (*i.e.,* addressing the oldest airplanes first) and on available resources. However, the agency does not agree that "early" establishment of an LOV will result in an "erroneous" LOV. Setting an LOV without benefit of significant service experience might result in an LOV that sets the limit at a lower number of flight hours or flight cycles than one that benefits from significant service experience, but it would be incorrect to characterize it as "erroneous." This is because the LOV is a function of the fatigue knowledge base available at the time it is established.

a. Pre-Amendment 25–45 Airplanes

Industry representatives on the AAWG, Boeing, Continental Airlines, Northwest Airlines, ATA, and FedEx pointed out that the first group of airplanes is collectively at the highest risk because of cumulative time in service and the limited fatigue test data available for these models. They recommended that the compliance date for the first group of airplanes should be by a certain date after the effective date of the rule. The AAWG's final report [25] recommends that LOVs be established for the first group of airplanes by June 2009, or 18 months prior to the operator's compliance date for the final rule, whichever occurs later. This would also provide sufficient time for Structures Task Groups [26] including operators of affected airplanes, to participate in establishing the LOVs. A later Boeing comment, however, requested that the compliance dates for those airplanes be 36 months, instead of 18 months (as stated in the technical document), from the effective date of the rule. Boeing stated that this additional time would allow them to have the FAA review and accept the Boeing proprietary LOV methodology, prepare LOV fleet proposals, and coordinate them within Boeing and with operators before submitting them to the FAA for review and approval.

The FAA agrees that pre-Amendment 25–45 airplanes should be addressed first because they are among the oldest airplanes and at the highest risk for developing WFD. In fact, most high-time pre-Amendment 25–45 airplanes have exceeded their design service goals. While the FAA understands that LOVs have been developed for a number of affected airplanes, the agency also understands that not all design approval holders have begun or completed this activity on all affected models. The FAA recognizes the benefits of allowing Structures Task Groups to participate in setting LOVs. Therefore, the FAA has determined that the compliance period for the oldest affected airplanes should be increased to 18 months to allow sufficient time for design approval holders to show compliance with today's rule. This increases by six months the amount of time design approval holders have to comply over what was anticipated in the NPRM. The 2007 AAWG Task 3 Report further supports the compliance date of 18 months. In its report, the AAWG stated that most of the work for the pre-Amendment 25–45 airplanes has already been completed. As a result, we do not concur with the commenter that 36 months is necessary to establish LOVs.

[25] Aviation Rulemaking Advisory Committee; Transport Airplane and Engine Issues—New Task, dated April 11, 2007.

[26] A Structures Task Group is a model-specific group that consists of type certificate holders and operators responsible for the development of aging airplane model-specific programs. It also includes regulatory authorities which approve and monitor those programs.

b. Airplanes Certified to Amendment 25–45 or Later

For the second group of airplanes (certified to Amendment 25–45 or later), industry representatives on the AAWG, Boeing, Continental Airlines, Northwest Airlines, ATA, and FedEx recommended setting a compliance date for design approval holders to establish LOVs that are tied to both the design service goal and the cumulative time on the high-time airplanes of that model. Specifically, the industry representatives on the AAWG proposed that within 180 days of the effective date of the rule, the type certificate holders provide design service goals for all affected airplane models to the FAA for approval. Once approved, these design service goals would be placed in an appropriate certification document. Other commenters—including Cessna, Continental Airlines, Embraer, AWAS, the CAA, American Airlines, Boeing, Airbus, and FedEx—agreed with industry representatives on the AAWG that the compliance date for setting LOVs should take into account both the design service goal and the cumulative time on the high-time airplanes of that model.

The industry representatives on the AAWG proposed that the design approval holder prepare a compliance plan with a binding schedule for a WFD evaluation when the high-time airplane reaches a point five years from its design service goal. The AAWG industry representatives suggested that a means of determining this time should be included in AC 120–YY. FedEx and Lynden Air Cargo suggested that the FAA use the design service goals that are being developed under the Damage Tolerance Data Rule to establish compliance dates for establishing LOVs and associated WFD maintenance actions. The commenters said that if no design service goal or design service objective exists, the LOV should be established when the high-time airplane of a particular model reaches 20 years of age.

In contrast, United Parcel Service and Technical Data Analysis, Inc. supported establishing LOVs for all affected airplane models as soon as possible, because of the uncertainty associated with estimating future operating costs and the length of time that airplanes can be operated.

The WFD risk for these newer airplane models is lower than for the pre-Amendment 25–45 airplanes because these airplanes are generally younger and have been certified to damage tolerance requirements. Therefore, the FAA agrees with the industry representatives on the AAWG and other commenters that the compliance times can be longer for these airplanes. On the other hand, the proposal of the AAWG industry representatives would add a level of complexity and uncertainty to determining compliance times that the FAA considers unnecessary and inappropriate and that would make operators' long-term planning difficult.

Therefore, as discussed earlier, to accommodate the need for a longer compliance time for these airplanes, this final rule creates three groups of airplane models for determining compliance dates.

- Group I—Pre-Amendment 25–45 (1978) airplanes.
- Group II—Airplanes certified to the requirements of § 25.571, Amendment 25–45, up to but not including Amendment 25–96 (1998).
- Group III—Airplanes certified to requirements of § 25.571, Amendment 25–96 or later.

Group II airplane models were all subjected to full-scale fatigue test programs. In addition, all the models in this group have been in service for a period of time. There should, therefore, be a reasonable knowledge base readily available on which to base an LOV. Today's rule requires establishment of an LOV for all these models within 48 months of the effective date of the rule, as indicated in Table 1 of § 26.21. This would allow design approval holders to schedule development of these LOVs after the more urgent development of LOVs for pre-Amendment 25–45 airplanes, so project schedules would not conflict. At the same time, this compliance time would ensure that LOVs are established long before the high-time airplanes of these models would reach their anticipated LOVs.

Design approval holders of those models in Group III have had to demonstrate or will have to demonstrate with sufficient full-scale test evidence that WFD will not occur within the design service goal of the airplane. Therefore, the design service goal would be a valid LOV that is based on the knowledge base considered. However, because these airplanes have not accumulated much time in service, there is less urgency in establishing an LOV. As a result, the final rule provides 60 months after the effective date of the rule to establish an LOV for these models. (*See* Table 1 of § 26.21.) This provides time to re-evaluate the fatigue data and to establish an LOV which may exceed the design service goal. Extending the compliance date for Group III airplanes beyond the compliance date for Group II airplanes reduces the resource concerns about developing LOVs for multiple airplane models at the same time.

Table 1 of § 26.21 includes a compliance date for airplanes that do not appear in the table but may have had a type certificate approved by the effective date. These have a compliance period of 60 months. Some type certificates are pending and may be approved shortly. This last row of the table is meant to capture any additional airplanes that fit the applicability criteria of § 26.21(a).

Table 1 of § 26.21 is used to call out existing airplanes and assign compliance dates. Holders of type certificates for these models must comply with § 26.21(c)(1). The remainder of § 26.21(c) specifies additional people who must comply.

Under today's rule, the compliance times specified in § 26.21(c) for when applicants must establish an LOV include the date specified in the applicant's plan for completion of the full-scale fatigue testing and analyses of the testing to demonstrate compliance with § 25.571(b).[27] All applicants who must comply with § 26.21 may use this date as one option for compliance.

Applicants who have the same compliance times and the option to use the date specified in the § 25.571(b) plan are:

- Applicants for type certificates for which the application is pending as of the effective date.
- Applicants for amendments to type certificates (with the exception of those that change the weight of the airplane).

All of these applicants are required to establish LOVs at the latest of the following dates:

- The date the type certificate or amended type certificate is issued,
- Within 60 months after the effective date of the rule, or
- The date specified in the plan approved under § 25.571(b) indicating when the full-scale fatigue testing and evaluation will be complete.

Among these applicants, WFD is of less immediate concern because their high-time airplanes will have accumulated relatively few flight cycles or flight hours by the compliance date. Establishing LOVs early in the service life of these airplanes will assist operators in their long-term planning. This approach also serves as a transition to § 25.571 as amended by this final rule, which requires establishing LOVs as part of initial type certification.

[27] Under § 21.17, these applicants are subject to § 25.571 at Amendment 25–96. In addition to this certification basis, they are subject to the requirements of this final rule.

Maximum takeoff gross weight changes to an airplane are treated separately in this rule. Holders of either supplemental type certificates or amendments to type certificates that increase maximum takeoff gross weights from 75,000 pounds or less to greater than 75,000 pounds must comply no later than 18 months after the effective date.

Applicants for supplemental type certificates or amended type certificates that increase the maximum takeoff gross weight to greater than 75,000 pounds must comply by the latest of the following:

• Within 18 months after the effective date of the rule,
• The date the certificate is issued, or
• The date specified in the plan approved under § 25.571(b) indicating when the full-scale fatigue testing and evaluation will be complete.

The option of 18 months after the effective date as a compliance choice for this group represents a six-month increase in the time to comply over what was originally proposed. We based these compliance dates on the length of time given for design approval holders of Group I airplanes to comply.

The NPRM did not specify a compliance time for applicants for design change approvals that, after the effective date of the rule, decrease the maximum takeoff gross weight to 75,000 pounds or less. This is because the applicability provision in the NPRM included airplanes with maximum takeoff gross weights exceeding 75,000 pounds, as approved during the original type certification. By referencing the capacity resulting from original type certification, the NPRM required applicants to establish LOVs for design change approvals that, after the effective date of the rule, decrease the maximum takeoff gross weight to 75,000 pounds or less. Although not explicitly stated in the NPRM, the LOV for those airplanes is required to be established by the compliance date for the original type certification or, in the case of applicants, by the date the approval of the design change has been issued. Because the NPRM was not clear about when those applicants must comply, the FAA has revised today's rule. Applicants for design change approvals that decrease the maximum takeoff gross weight to 75,000 pounds or less after the effective date of the rule must comply within 18 months after the effective date of the rule or by the date the certificate is issued or by the date specified in the plan approved under § 25.571(b), whichever occurs latest.

The FAA has also revised the compliance times to require those applicants who would decrease the gross weight of their airplanes after the effective date of the rule to submit a compliance plan within 90 days after the date of application.

3. Varying Implementation Strategies

APA suggested a way to address concerns about the time needed to develop an LOV. The commenter stated that the initial LOVs under consideration, as defined in the Technical Document, appear to be extremely liberal and based on limited data and minimal analysis. APA assumed that manufacturers would need more time to develop their analysis procedures, and said that a better approach for establishing the initial LOV would be to increase the design service goal by 10% to 15% and mandate inspections of high-time airplanes that are over their design service goal. APA based its suggestion on an assumption that the design service goals were based on hard test and engineering data. The commenter suggested halving the interval between maintenance checks for airplanes over their design service goal. Then, the commenter suggested, results of these inspections could be given to the manufacturer for use in substantiating the engineering WFD analysis. This data could be used to validate future incremental LOV increases.

Although this commenter maintained that design service goals are based on hard test and engineering data, that has not always been the criteria by which design service goals have been set. Amendment 25–96 to § 25.571 introduced requirements that applicants show freedom from WFD up to the design service goal. Prior to Amendment 25–96, however, there was no requirement for setting a design approval holder's design service goal or for validating it. Design approval holders have always used engineering data to substantiate their designs. Most design approval holders set design service goals for their airplanes, even though they were not required to do so. But since there were no requirements prior to Amendment 25–96 about what criteria must be used to set the design service goal, they have often been set for purposes driven more by sales and marketing than by engineering data.

Some design approval holders have stated that LOVs may be established at a point anywhere from 33% to 180% higher than the airplane's design service goal for certain models. This is because, for those design approval holders, there is a large body of in-service data to support these higher LOVs. Other design approval holders have taken an approach similar to APA's recommendation, in that they have been incrementally increasing their airplane model's LOV as the data supports it. Today's rule allows for an implementation strategy that provides flexibility to design approval holders in determining the timing of service information development (with FAA approval), while providing operators with certainty regarding the LOV applicable to their airplanes. However, no matter how the design approval holder chooses to manage LOV development, those LOVs must still be substantiated by engineering data.

4. FAA Review and Approval Time

Industry representatives on the AAWG, Boeing, Airbus, and CAA requested that the rule include required time periods for FAA review and approval activities. These commenters noted that the rules do not currently limit the amount of time the FAA will take to review and approve documents and that this will negatively affect their compliance time. Several commenters also noted that the amount of time the FAA will take to review and approve design approval holders' LOVs could reduce operator compliance time significantly.

We are not including required time periods for FAA review and approval of the required compliance activities. Instead, expectations for FAA personnel have been defined in FAA Order 8110.104, which directs the Aircraft Certification and Flight Standards Services in their roles and responsibilities for implementing these initiatives. The order includes expected times (6 weeks) for reviewing and approving design approval holder compliance plans, plans to correct deficiencies, and draft and final compliance data and documents. To facilitate implementation, the FAA will train affected personnel in their roles and responsibilities and provide in-depth familiarization with requirements of the regulations and associated guidance. Ultimately, however, the timing of FAA approvals will be determined by the quality of the design approval holder submissions and their responsiveness to issues raised by the FAA.

We have structured the requirements of the design approval holder rule and developed complementary guidance to facilitate timely review and approval of design approval holder submittals (such as compliance plans). An increase in operator compliance time would help ensure that operators are not affected by the FAA review and approval process. We have revised the WFD compliance date for operators from 6 months to 12 months after the relevant design approval holder compliance date. This date is measured after the effective date of the final rule. As previously noted, for Group I, II, and III airplanes, the operator compliance dates are 30, 60, and 72 months, respectively, after the effective date of the rule.

G. LOVs for Future Airplanes: § 25.571, Appendix H, and Operational Rules

This final rule revises § 25.571 to require that—

- An LOV be established that corresponds to the time during which it is demonstrated that WFD will not occur in the airplane structure, and
- The LOV be included in the Airworthiness Limitations section of the Instructions for Continued Airworthiness required by § 25.1529.

Except for the change in terminology from initial operational limit to LOV, these revisions to § 25.571 are as proposed in the NPRM.

For operators of airplanes type certificated in the future, this final rule relies on existing operational rules to require operators to include the airplane's LOV, which is established under § 25.571 of today's rule, into their maintenance/inspection programs. This requirement is the same as that which was proposed in the NPRM.

1. Opposition to Changes to § 25.571

Industry representatives on the AAWG and Airbus commented that no change is needed to § 25.571 because airplanes certified to Amendment 25–96 must be free from WFD until they reach the design service goal, and the design service goal must be declared in the appropriate certification document.

We recognize that § 25.571 at Amendment 25–96 requires full-scale fatigue test evidence to demonstrate freedom from WFD up to the design service goal. However, the current regulations do not require that the Airworthiness Limitations section include the design service goal as an airworthiness limitation, so operators would be permitted to operate airplanes beyond this goal indefinitely. Therefore, the FAA finds it necessary to revise § 25.571, as proposed, to require that full-scale fatigue test evidence be used to demonstrate freedom from WFD up to the LOV and that the LOV be included in the Airworthiness Limitations section. These changes are consistent with recommendations made in 2003 by the General Structures Harmonization Working Group, a separate working group within ARAC.

2. Change to Appendix H

Under § 25.571, the FAA may issue a type certificate for an airplane model prior to completion of full-scale fatigue testing. As stated in the NPRM, the FAA did not propose to change this provision because the FAA intends that operators be able to operate these airplanes while the design approval holder is performing fatigue testing. Today's rule retains the requirement of § 25.571 that—if a type certificate is issued prior to completion of full-scale fatigue testing—the Airworthiness Limitations section must include a number equal to ½ the number of cycles accumulated on the fatigue test article. As additional cycles on the test article are accumulated, the number may be adjusted accordingly. This number is an airworthiness limitation, and no airplane may be operated beyond it until the fatigue testing is completed and the LOV is established.

For consistency however, the FAA has revised paragraph (a)(4) of H25.4 to part 25 (Appendix H) to include a reference to the limitation that an airplane may accumulate a number of cycles not greater than ½ the number of cycles accumulated on the fatigue test article until such testing is completed.

3. When to Set LOVs for Future Airplanes

Industry representatives on the AAWG, Boeing, and American Airlines commented that design approval holders should not be required to establish an LOV for a future airplane until the high-time airplane approaches its design service goal. United Parcel Service, on the other hand, recommended that the initial LOV be established during the initial certification process, and before the first airplane enters service. The ATA recommended that LOVs should be estimated at the time of airplane certification but should be reassessed when the high-time airplane approaches 75% of the estimate.

The LOV is a function of the fatigue knowledge base available at the time it is established. There should be sufficient data to establish an LOV for a new airplane model being certificated once full-scale fatigue test evidence is completed and assessed, normally several years after the airplane enters service. We agree that an LOV established for a new airplane model could be reassessed later when service information could be used with other data necessary to extend the LOV. Eliminating the requirement to address repairs, alterations, and modifications will simplify the process for extending the LOV.

The FAA does not agree that establishment of an LOV for a future airplane model should wait until the high-time airplane approaches its design service goal. As discussed previously, establishing design approval holder compliance dates that are a function of when high-time airplanes reach their design service goal would introduce a level of complexity and uncertainty to the requirements of the operational rules that is unnecessary and inappropriate.

One manufacturer is already employing the concept of establishing LOVs based on the fatigue knowledge base available through the certification process. Airbus has already included an LOV in the applicable Airworthiness Limitations section approved by EASA for all of its models with the exception of the A340.

4. Operational Rules

For airplanes whose type certificate application is made after the effective date of this final rule, LOVs must be established by the date the certificate is issued or the date specified in the plan approved under § 25.571(b). The LOV will be included in the Airworthiness Limitations section of the Instructions for Continued Airworthiness and will apply regardless of how or by whom the airplane is operated.

As discussed above, the FAA may issue a type certificate for an airplane model before full-scale fatigue testing has been completed. In that case, the Airworthiness Limitations section of the Instructions for Continued Airworthiness must include a number equal to ½ the number of cycles accumulated on the fatigue test article. Under § 91.403(c), operators may not operate these airplanes beyond this number of cycles. Once the fatigue testing is completed and the LOV is established and approved, operators may revise this airworthiness limitation to include the LOV. This LOV will be higher than the airworthiness limitation specifying ½ the number of fatigue test article cycles.

H. How to Set LOVs

Section 26.21(b) of this final rule requires design approval holders to establish an LOV of the engineering data that supports the structural maintenance program. This LOV corresponds to the period of time, stated as a number of total accumulated flight cycles or flight hours, or both, during which the design approval holder is able to demonstrate that WFD will not occur in the airplane. This demonstration must include an evaluation of airplane structural configurations and be supported by test evidence and analysis. If available, service experience, or service experience and teardown inspection results, may be added to the test evidence and analysis to provide additional substantiation. The service experience and teardown inspections must be of high-time airplanes of similar structural design, accounting for differences in operating conditions and procedures.

The NPRM proposed in § 25.1807(b) [adopted here as § 26.21(b)] that holders of design approvals for existing airplanes subject to the rule be required to evaluate airplane structural configurations to determine when WFD was likely to occur for structure susceptible to multiple site damage or multiple element damage. The results of the evaluation were to be used to support establishment of an initial operational limit (now the LOV.)

The Boeing Company and industry representatives on the AAWG commented that proposed § 25.1807 would require an "evaluation" that is not adequately defined and that there are no objective criteria for establishment of an LOV. These deficiencies could result in establishment of an LOV based solely on analyses of structure susceptible to multiple site damage and multiple element damage, without consideration of more relevant and reliable data, such as test evidence and service experience. These commenters concluded that, in these circumstances, airplanes could be operated well past the point to which the engineering data supports safe operation.

The commenters recommended that the required evaluation explicitly include the following tasks, which are described in the AAWG's 2003 report [28] as necessary to establish or extend an LOV.

1. Ensure that the basics of the Aging Aircraft Program are in existence.
2. Collect data necessary to extend fatigue test evidence.
3. Perform analysis of the structure for multiple site damage and multiple element damage.
4. Create and update maintenance documents to include maintenance actions and modifications for those areas where it has been predicted that multiple site damage and multiple element damage will occur before the proposed LOV.

In addition, industry representatives on the AAWG and Boeing recommended that the rule explicitly use the term "fatigue test evidence" to refer to the collective body of information that should be considered in establishing an LOV. The FAA agrees that the first task, having basics of the four elements of the Aging Aircraft Program in place,[29] is an important element for continued safe operation out to LOV. However, as discussed in the NPRM, this final rule does not include requirements related to those initiatives because they are already mandated by airworthiness directives, operational rules, and airworthiness limitations.

The FAA considers that tasks 2 and 3 are implicit in the text of the proposed rule but agrees that proposed § 25.1807 could be misinterpreted and result in too much reliance on results of analysis to preclude WFD up to the LOV. This was not our intent. In fact, as discussed in the NPRM, our intent was consistent with the AAWG's recommendations regarding WFD.

In response to these commenters, the FAA has revised the proposed rule to clarify how the LOV is to be established. This final rule specifies that—for an LOV to be acceptable—the supporting evaluation must demonstrate that the fatigue characteristics and any specified maintenance actions for the airplane are sufficient to prevent WFD from occurring before the LOV.

The required demonstration typically involves an evaluation of the airplane structure to determine its susceptibility to WFD and, if the structure is susceptible, an evaluation indicating that WFD will not occur before the proposed LOV. The evaluation must be supported by test evidence and analysis. The design approval holder may augment the test evidence and analysis with any available service experience, or service experience and teardown inspection results of high-time airplanes. Service experience and teardown inspection results must be of airplanes of similar structural design and must account for differences in operating conditions and procedures. After seeing these changes to the rule as they were described in the Technical Document, Boeing stated that it supports the FAA's adoption of an airplane-level assessment of fatigue test evidence as the basis for both the determination and extension of LOV.

The FAA is using the term "test evidence" to align with the rule text of § 25.571 relative to WFD. Therefore, in the context of this final rule, test evidence is data derived from full-scale fatigue testing, which may be of the complete airplane, or of separate major sections of the airplane, or a combination of the two. The test evidence would be used to support the proposed LOV for an airplane model. The amount of test evidence required to show compliance would depend on where a design approval holder proposes to set an LOV and what data (such as test evidence or service experience) already exist.

For a new airplane model that is pending approval, there should be test evidence to address all WFD-susceptible structural areas of an airplane. The test duration should be at least two times the proposed LOV. The test evidence may be from prior full-scale fatigue tests performed by the applicant or others on similar structure. For derivative models, the applicant should compare the derivative model to the tested model. To use the test evidence from the original certification project or previous derivatives, the applicant should show that the derivative model does not significantly change the basic structural design concept, aerodynamic contour, and internal load distribution. Advisory Circulars 120–YY and 25.571–1X further describe considerations for when existing test evidence could be used.

For some older airplanes, fatigue test data may be limited to fuselage structure. This is because the pressurized fuselage has been considered to be the most fatigue-critical part of the airplane. The wing and empennage have typically been considered less critical and, as a result, relevant test data may not exist. However, for these same airplane models, significant service experience does exist. The FAA would accept a combination of test evidence and analysis as well as service experience as data to show compliance with this final rule.

For example, in the case of one of the pre-Amendment 25–45 airplane models, significant numbers of airplanes both in service and in storage have accumulated flight cycles in excess of the design service goal. For this model, there is significant existing test evidence for the fuselage, but very little for the wing. In this case, the FAA expects that demonstrating freedom from WFD for the wing would be based primarily on service experience; for the fuselage, it would be based primarily on service experience and test evidence. Advisory Circular 120–YY further describes considerations for when service experience could be used to supplement existing fatigue testing that is limited to certain major components of the airplane, such as the fuselage.

[28] AAWG, Widespread Fatigue Damage Bridge Tasking Report, July 23, 2003.

[29] Mandatory modification, corrosion prevention and control, supplemental structural inspection, and repair assessment.

The FAA has used the term "analysis" to include fatigue and damage tolerance analyses. Teardown inspections of in-service airplanes and fatigue test articles should be performed to the degree necessary to validate that the test evidence, analysis, and service experience are representative of the fatigue performance of the airplane out to the LOV. Design approval holders must explain in their certification plan how they intend to substantiate their proposed LOV. The FAA has revised AC 120–YY to provide further guidance on the steps to take for establishing an LOV.

As discussed in the NPRM, design approval holders are not required to identify and develop maintenance actions if they can show that such actions are not necessary to prevent WFD before the airplanes reach LOV. If they choose to establish LOVs that rely upon maintenance actions to prevent WFD before the LOV, they must identify those actions and, unless the necessary service information already exists, develop the service information in accordance with a binding schedule approved by the FAA. Those actions would then be mandated, not by today's rule, but by future airworthiness directives.

To be approved, the "binding schedule" for necessary maintenance actions must ensure that the service information is provided in a "timely manner." In the NPRM, the FAA explained that the purpose of this requirement was to enable the FAA to issue the necessary airworthiness directives in time to allow operators to accomplish these actions during normal maintenance. The intent is to allow design approval holders the flexibility to focus their efforts on initially developing service information on those maintenance actions that must be accomplished first. At the same time, the FAA expects design approval holders to devote sufficient resources to these efforts so that:

- The service information is available when the FAA needs it to initiate the airworthiness directive rulemaking process, including providing public notice and opportunity to comment; and
- The resulting airworthiness directives will provide sufficient compliance times so that the required actions can be accomplished without disrupting operators' normal maintenance schedules.

Airbus stated that the analysis is the driver for substantiating LOVs and that test evidence supports the analysis.

Analysis methods are used in combination with the engineering data to characterize WFD behavior to the degree necessary to determine if maintenance actions are required prior to the proposed LOV. As a result, test evidence and analysis are both required to demonstrate freedom from WFD. This is consistent with the existing requirements of § 25.571 at Amendment 25–96.

We agree that a design approval holder may not have both service experience and teardown inspection results available to use as part of its compliance data. We have modified the requirement so that a design approval holder may have either service experience or service experience and results of teardown inspections. The change is follows:

"This demonstration must include an evaluation of airplane structural configurations and be supported by test evidence and analysis at a minimum and, if available, service experience, or service experience and teardown inspection results, of high-time airplanes of similar structural design, accounting for differences in operating conditions and procedures."

I. How To Extend LOVs

Proposed § 25.1811 provided that any person could apply to extend an operational limit, using a process similar to that for establishing the initial operational limit. The configuration to be evaluated would consist of not only all model variations and derivatives approved under the type certificate for which the extension is sought, but also all structural repairs, alterations, and modifications to those airplanes, whether mandated by airworthiness directive or not.

Section 26.23(b) of this final rule (proposed as § 25.1811) contains requirements for obtaining approval of an extended LOV that corresponds to the period of time, stated as a number of total accumulated flight cycles or flight hours or both, beyond an existing LOV during which it is demonstrated that WFD will not occur in the airplane. This demonstration must include an evaluation of airplane structural configurations and be supported by test evidence and analysis at a minimum and, if available, service experience, or service experience and teardown inspection results of high-time airplanes of similar structural design, accounting for differences in operating conditions and procedures. Requirements for this section are the same as those for establishing an LOV. The FAA has removed the requirement to evaluate repairs, alterations, and modifications from § 26.23.

1. Change the Procedure for Extending LOVs

Industry representatives on the AAWG, ATA, Cessna, Airbus, United Parcel Service, FedEx, Boeing, and American Airlines stated that the means proposed in § 25.1811 for extending an operational limit is administratively difficult, impractical, and technically unachievable. The commenters expressed doubt that the proposed process could be realistically or uniformly accomplished because different operators will be involved in extending the LOV for the same airplane model. Furthermore, said the commenters, it is unlikely that any single operator has the information necessary to obtain an extended LOV. The cost, and uncertainty about the outcome of the evaluation, would make this process nearly impossible for an operator to attempt.

The commenters added that extending an LOV would need to be done by addressing each individual airplane, identified by tail number, whereas the maintenance actions which support the initial LOV are based on statistics pertaining to behavior of the entire fleet of a particular model. Thus, the method of determining maintenance actions to preclude WFD out to the LOV is not valid for a single airplane. The AAWG industry representatives recommended that establishing an extended LOV and evaluating repairs, alterations, and modifications be a sequential process. The first step would be to establish the extended LOV. The second step would be for each design approval holder for a modification to evaluate its own design relative to the extended LOV and obtain a separate, independent approval for its design. The operator would continue to be responsible for assembling all maintenance requirements, depending on actual airplane configuration, and for obtaining approval of the maintenance program from the principal maintenance inspector. Such a process is similar to industry proposals for compliance with the Aging Airplane Safety Final Rule.

Several commenters also remarked that the administrative process for obtaining an amended type certificate or supplemental type certificate will be extraordinarily difficult to manage because manufacturers, operators, and holders of supplemental type certificates do not necessarily have access to each other's proprietary information. The existing business and legal agreements in place did not contemplate the high degree of data disclosure that will be required to develop WFD guidance material and data needed for an amended type certificate or supplemental type certificate. Furthermore, many transport airplanes are converted to operate in different roles than those for which they were originally designed. Often operators cannot obtain support or design data from design approval holders because the latter have concerns about liability, are no longer in business, or are more motivated to sell new airplanes than to support old ones.

Several commenters recommended that the FAA delete proposed § 25.1811 and revise proposed § 25.1807 to allow extension of an LOV by a process approved by the Administrator. They base their recommendation on the fact that the technical requirements for establishing an LOV are no different from those for establishing an extended LOV.

The FAA agrees that, given the extensive information required to develop guidelines for including a WFD evaluation of repairs, alterations, and modifications, the proposed requirements for extending the LOV needed to be changed. As discussed earlier, the FAA has removed those requirements. As a result, this final rule includes requirements for extending an LOV based on the original LOV airplane configuration plus all new structural modifications or replacements mandated by airworthiness directives. The FAA has revised requirements of § 26.23(b) to be consistent with § 26.21(b). As previously stated, if our research demonstrates that additional actions are needed to address risks for repairs, alterations, and modifications, the FAA will consider further rulemaking.

The FAA does not agree with the suggestions to allow extension of an LOV using a process approved by the Administrator. In this final rule, requirements for extending an LOV are similar to those for establishing the first LOV. However, the design approval holder is not required to develop the data to support an extended LOV because such extensions are optional. The extended LOV and associated maintenance actions (inspections, modifications, or replacements) must be defined within the Airworthiness Limitations section for the airplane. This requirement is unchanged from the proposed requirements of § 25.1811(b) of the NPRM. As stated in the NPRM, the FAA intends to use airworthiness directives to mandate any maintenance actions necessary to reach the LOV established under § 26.21, so that operators will have an opportunity to comment on the proposed maintenance actions. It is not necessary to use this process for extensions of the LOV, however, because the extended LOV would include all maintenance actions at the time of approval. For these reasons, the FAA has kept requirements for extending an LOV separate from § 26.21. The FAA has revised AC 120–YY to provide guidance on establishing an extended LOV.

2. Evaluation of Repairs, Alterations, and Modifications for an LOV Extension

EASA stated that certain existing repairs, alterations, and modifications should be evaluated for WFD when the LOV is being extended. EASA states that the risk of WFD increases for repairs, alterations, and modifications as airplanes age.

As discussed elsewhere in this document, an extension should be based on the airplane's structural configuration, just as the initial LOV is. Persons establishing extensions to LOVs may identify conditions or limitations in the Airworthiness Limitations section of the Instructions for Continued Airworthiness that apply to the extensions. For example, the LOV extension may only be valid for airplanes that operate at a certain cabin differential pressure or maximum takeoff gross weight. Operators may have to evaluate their airplanes and take certain actions prior to incorporating any extensions. AC 120–YY provides additional guidance on this.

3. Alternate Means of Compliance (AMOCs)

APA commented that operators should not be allowed alternate means of compliance (AMOCs) for the WFD rule because, it says, if the FAA allows AMOCs as it does with airworthiness directives, the ability to collect data and track compliance will be greatly complicated. Each operator, said the commenter, will comply in a manner with the least financial impact to its company. This may or may not be supported by the ongoing efforts of the original equipment manufacturers to develop analysis techniques and procedures. It will also add significant financial costs to the original equipment manufacturers and the FAA to support, track, and verify each AMOC.

The initial LOV is established and approved under § 26.21 or § 25.571. Any extension to the initial LOV or any subsequent LOV is established and approved under § 26.23. The FAA does not issue AMOCs for these regulations. Any deviation from a rule is handled via the procedures contained in 14 CFR part 11.

Under § 26.21, any maintenance actions needed to support the initial LOV will be mandated by airworthiness directives, and compliance with those airworthiness directives and the ability to apply for an AMOC for those maintenance actions will not involve procedures that are any different from those used for airworthiness directives today. An AMOC for the maintenance actions for an initial LOV will not affect the LOV itself.

Under § 26.23, however, any maintenance actions developed to support the extended LOV will be incorporated into the Airworthiness Limitations section of the Instructions for Continued Airworthiness. The maintenance actions for extended LOVs will not be published in airworthiness directives.

4. Extension Procedure Doesn't Allow Public Comment

ATA and Northwest Airlines stated that the proposed rule does not permit the public to comment on extensions to LOVs and the maintenance actions that support them. Extensions to LOVs mandated by airworthiness directive would allow the opportunity for public comments on extended LOVs.

Although mandating LOV extensions by airworthiness directive would allow the public the opportunity to comment, the FAA does not agree with the suggestions to use airworthiness directives to allow extension of an LOV. This is for two reasons:

- Approving an extended LOV isn't rulemaking; it's a finding of compliance with the applicable regulatory standard (*i.e.,* freedom from WFD).
- If the FAA doesn't extend the LOV, or subsequent extensions of that LOV, there's no unsafe condition justifying an airworthiness directive, because affected airplanes are grounded when they reach the LOV.

The FAA has revised AC 120–YY to provide guidance on establishing an extended LOV.

The AAWG recommended in its Task 3 Report that design approval holders and operators work together in establishing LOVs and LOV extensions. Under today's rule, the FAA expects that design approval holders and operators will work together when persons are seeking approval for extended LOVs.

J. Applicability for Existing Airplanes

The rule proposed in the NPRM would apply to existing transport category airplanes with a maximum takeoff gross weight greater than 75,000 pounds, by virtue of either the original type certification of the airplane or a later increase, that are operated under part 121 or 129.

This final rule applies to certain existing transport category, turbine-powered airplanes with a maximum takeoff gross weight greater than 75,000 pounds and a type certificate issued after January 1, 1958, regardless of whether the maximum takeoff gross weight is a result of an original type certificate or a later design change. In addition, it applies to transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958, if a design change approval for which application is made after the effective date of the rule has the effect of reducing the maximum takeoff gross weight from greater than 75,000 pounds to 75,000 pounds or less. It also applies to operators of those airplanes being operated under part 121 or 129.

1. Type Certificates Issued After January 1, 1958

As proposed, applicability of the rule was not limited to turbine-powered airplanes with type certificates issued after January 1, 1958. Everts Air Cargo requested that McDonnell Douglas Model DC–6 airplanes be excluded from applicability, and Boeing requested that both the DC–6 and DC–7 be excluded. Everts Air Cargo stated that its airplanes are non-pressurized, which should reduce the risk that they would develop WFD. Both Boeing and Everts pointed out that §§ 121.370a and 129.16 of the Aging Airplane Safety Final Rule apply only to certain transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958. The commenters recommended that the rule pertaining to WFD apply only to those same airplanes.

The FAA agrees that certain parts of the applicability of this final rule should align with the Damage Tolerance Data Rule and the Aging Airplane Safety Final Rule and other aging airplane rules, such as EAPAS/FTS. The McDonnell Douglas DC–6 and DC–7 airplanes have not had a damage tolerance assessment and have not been included in the Damage Tolerance Data Rule. In addition, the risk from excluding these airplanes is small because there are so few of them.

Therefore, in this final rule the FAA has added the phrase "transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958" to the applicability provisions of § 26.21 and to the operating rules. The change means that the following airplanes, which would have been affected by the proposal, are not subject to this final rule:

- McDonnell Douglas Models DC–6 and DC–7.
- Lockheed Model 1649A–98.
- Lockheed Model 1049 Series.
- Lockheed Models 49–46, 149–46, 649–79, 649A–79, 749–79, and 749A–79.

2. Original Type Certification

The applicability provision in proposed § 25.1807 included airplanes with maximum takeoff gross weights exceeding 75,000 pounds, as approved during original type certification, as well as airplanes with lower weights that had been increased to greater than 75,000 pounds through later design changes. This applicability provision was intended to address two situations. In the past, some designers and operators avoided applying requirements mandated only for airplanes over a specific capacity by receiving a design change approval for a slightly lower capacity. By referencing the capacity resulting from original type certification, the NPRM removed this means of avoiding compliance.

Similarly, an airplane design could be originally certified with a capacity lower than the minimum specified in the rule, but through later design changes, the capacity has been increased above this minimum. The reference in the NPRM to a later increase in capacity was intended to ensure that, if this occurs, the design would have to meet the requirements of the rule.

The applicability proposed in the NPRM did not distinguish among design changes based on whether their date of application for design approval occurred before or after the rule's effective date. That provision in proposed § 25.1807 is similar to that for the EAPAS/FTS, Fuel Tank Flammability, and Damage Tolerance Data Rules. In addition, the reference to capacity resulting from original type certification is common to proposed § 25.1807 and the other rules. The agency has determined that the approach to applicability under today's rule should be slightly different from that used in previous rules. This is to avoid requiring design approval holders to establish LOVs for models that have maximum takeoff gross weights that were decreased to 75,000 pounds or less by an amended type certificate or supplemental type certificate before the effective date of today's rule. Applicants for such design changes in the past could not have designed the airplanes' capacities to avoid complying with today's requirements, and it is not our intent to include them in the applicability of this final rule.

The FAA has revised this section (now § 26.21) to apply to transport category, turbine-powered airplanes with a maximum takeoff gross weight greater than 75,000 pounds and a type certificate issued after January 1, 1958, regardless of whether the maximum takeoff gross weight is a result of an original type certificate or a later design change. This section also applies to transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958, if a design change approval, for which application is made after the effective date of the rule, has the effect of reducing the maximum takeoff gross weight from greater than 75,000 pounds to 75,000 pounds or less.

The FAA has also revised the applicability of §§ 121.1115 and 129.115 to be consistent with the applicability of § 26.21 for existing airplanes. For future airplanes for which an LOV is approved in accordance with § 25.571 of today's rule, we have retained the requirement that §§ 121.1115 and 129.115 apply to operators of U.S.-registered transport category, turbine-powered airplanes, regardless of the maximum takeoff gross weight. For future design changes reducing the maximum takeoff gross weight from greater than 75,000 pounds to 75,000 pounds or less, the compliance date for operators is 30 months after the effective date of the rule, or the date of design change approval, or the date specified in the plan approved under § 25.571(b), whichever occurs latest. For these design changes, unless or until the design approval holder complies with § 26.21 by establishing a new LOV, the LOV applying to the airplane in the absence of the design change would still apply.

3. Airplane Configuration

This final rule requires that holders of type certificates for existing airplanes evaluate certain configurations of those airplanes for susceptibility to WFD and use the results of the evaluation to set LOVs for those airplanes. The configurations to be evaluated are:

- All model variations and derivatives approved under the type certificate, and
- All structural modifications and replacements to those airplanes which were mandated by airworthiness directives issued to address any configuration developed by the design approval holder.

In the NPRM, the FAA proposed evaluation of the same airplane configurations.

In their comments, the industry representatives on the AAWG, Boeing, and Airbus expressed concern about the proposed requirement to evaluate all structural modifications and replacements mandated by airworthiness directives. Airbus stated that this approach deviates from all previous industry recommendations and will lead to a significant increase in configurations to be assessed. The industry representatives on the AAWG, Boeing, and Airbus requested that the FAA reconsider this requirement and focus only on airworthiness directives which have been issued specifically to address WFD.

The FAA issues many airworthiness directives which require structural modifications or replacements not intended to address WFD. These required modifications or replacements, however, may affect susceptibility of a structure to WFD. A modification might introduce new details that cause a structure which was previously not susceptible to WFD to become susceptible, or make a change that increases susceptibility so that previously established maintenance actions need to be modified. Because today's rule is intended to address the potential for WFD in airplanes as they are actually configured, we must address these required modifications. It would serve no useful purpose to evaluate structural configurations which no longer exist in service because airworthiness directives have required modifications to those configurations.

Modifications mandated by airworthiness directives are much fewer in number than other modifications, and they generally affect airplanes of the same model in the same way. Many modifications mandated by airworthiness directives would not affect the potential for WFD; others could.[30] Therefore, the FAA is today issuing this requirement as proposed.

4. Weight Cutoff

In the preamble to the proposed rule, the FAA stated that the agency had considered applying the rule to all existing transport category airplanes, regardless of the maximum takeoff gross weight. The FAA acknowledged that using a weight cutoff of greater than 75,000 pounds excludes approximately 1,600 regional jets operating under parts 121 or 129, giving the impression that this rule might not align with our "One Level of Safety" initiative. However, the FAA justifies the proposed weight cutoff on the basis of the relatively young age of the regional jet fleet. Because those airplanes are younger, they have a low present risk for WFD.

Embraer agreed that existing regional jet airplanes should not be subject to the rule at this time, stating that the airplanes have typically been certificated to damage tolerance requirements. Other commenters—such as the National Transportation Safety Board, Transport Canada, the Air Line Pilots Association (ALPA), EASA, and an individual commenter—did not agree, because the regional jets are at risk of developing WFD as they accumulate flight cycles just as larger airplanes are. The ALPA recommended that the FAA form a study group to assess WFD in lighter airplanes. Pending a detailed risk analysis, the association suggested a weight cutoff of 12,000 pounds.

The 75,000 pound weight cutoff was based on recommendations from the AAWG for WFD rulemaking. The overwhelming majority of passengers and cargo are carried by airplanes with a maximum gross takeoff weight of greater than 75,000 pounds. Inclusion of airplanes below that limit and above 12,500 pounds is under study by the FAA and if service experience shows a need to include those airplanes, rulemaking will be considered to include them.

The FAA's highest priority is to address the oldest airplanes at highest risk of WFD—namely, airplanes with a maximum takeoff gross weight greater than 75,000 pounds. However, the FAA recognizes that the lighter and relatively younger regional jets will also be at risk of developing WFD as they accumulate flight cycles. We will reassess the fleet, including those airplanes below 75,000 pounds, after this rule has been implemented, to determine whether further rulemaking is necessary.

5. Default LOVs and Excluded Airplanes

a. Table 1—Default LOVs

In the proposed operational requirements in the NPRM, the FAA inadvertently created an ambiguity regarding the obligations of operators of airplanes for which the design approval holder might fail to establish an LOV as required. While the FAA fully anticipates that affected design approval holders will comply with the requirements of this final rule, there is a need to clearly provide for what happens if one or more does not. As proposed, paragraph (a) of §§ 121.1115 and 129.115 would apply to operators of airplanes for which an LOV "has been established." Paragraph (b) of these sections requires that operators incorporate approved LOVs.

Our expectation was that, if a design approval holder failed to comply with the requirement to obtain approval for an LOV, the operator or operators, in order to continue to operate the affected airplanes, would themselves obtain the necessary approval. Because they would not have access to the design approval holder's data necessary to perform a WFD evaluation, they would likely have to rely on the design service goals and extended service goals set forth in Table 3 of the NPRM (*see* below). As stated in the NPRM, "After June 18, 2008, an affected operator could not operate an airplane unless the operator has incorporated an Airworthiness Limitations section approved under Appendix H to part 25 or § 25.1807 into its maintenance program."

The FAA now recognizes that the final rule should explicitly define operators' obligations if the design approval holder fails to comply. Therefore, the FAA has revised the operational rules to state that, in the absence of an approved LOV, the operator must incorporate the applicable LOV specified in Table 1 [31] of either § 121.1115 or § 129.115. The table also adds flight hour numbers for design service goals for airplanes for which that information was available.

The inclusion of default LOVs in Table 1 does not prevent an operator from developing its own LOV under § 26.23 of this final rule. The rule specifies that—

- The design approval holder must establish an LOV, and
- If an LOV is not approved, an operator must use the default LOV in Table 1. If an operator later chooses to establish an LOV under § 26.23, that LOV will be considered an extended LOV.

This provision eliminates any need for operators to obtain a separate approval for these "default" LOVs. It also eliminates the risk that a relatively young airplane would be grounded as of an operator's compliance date simply because the FAA had not approved an LOV for that airplane.

Boeing stated that the default LOVs published in the Technical Document are without context and could be misused. Boeing said that it could provide more appropriate numbers to

[30] Advisory Circular 120–YY provides guidance on which modifications mandated by airworthiness directives should be assessed by the design approval holder.

[31] To develop Table 1, the FAA added airplanes to Table 3, deleted airplanes from Table 3, and split Boeing Models 737, 747, and 777 airplanes into two groups. These airplanes were added: Airbus A318 and A380; Bombardier CL–600 (2D15 and 2D24); and Embraer ERJ–170 and ERJ–190. The following airplane models were deleted: Boeing 707 and 720; Bombardier CL–44 and BD–700; British Aerospace Airbus, Ltd. BAC 1–11; British Aerospace (Commercial Aircraft) Ltd. Armstrong Whitworth Argosy A.W. 650 Series 101; BAE Systems (Operations) Ltd BAe 146A (all models), Avro 146 RJ70A, Avro RJ85A, and Avro RJ100A.

use, but that these numbers should be removed from the rule because Boeing intends to comply with the rule.

The default LOVs in Table 2 of § 121.1115 and § 129.115 are intended to be used by persons who may choose to operate one of the excluded airplanes. They may also be used by other operators if a design approval holder is late in establishing an LOV, in order to prevent airplanes with fewer accumulated flight cycles and flight hours than the default LOV from being grounded. A few airplanes, such as the Airbus A380, already have an operational limitation included in their Airworthiness Limitations section. These are referenced in the table by a NOTE, and may be used as a default LOV.

FIGURE 3—COMPARISON OF NPRM DESIGN AND EXTENDED SERVICE GOALS AND FINAL RULE DEFAULT LOVS

Airplane model	NPRM table 3	Final rule §§ 121.1115 and 129.115 table 1
	Design and Extended Service Goals (flight cycles)	Default LOVs [flight cycles (FC) or flight hours (FH)]
Airbus:		
A300 B2 Series [32]	48,000	48,000 FC
A300 B4–100 Series [33]	40,000	40,000 FC
A300 B4–203	34,000	34,000 FC
A300–600 Series [34]	30,000	30,000 FC/67,500 FH
A310–200 Series (all models)	40,000	40,000 FC/60,000 FH
A310–300 Series (all models)	35,000	35,000 FC/60,000 FH
A318 Series (all models)	None provided	48,000 FC/60,000 FH
A319 Series (all models)	48,000	48,000 FC/60,000 FH
A320–100 Series (all models) [35]	48,000	48,000 FC/48,000 FH
A320–200 Series (all models) [35]	48,000	48,000 FC/60,000 FH
A321 Series (all models)	48,000	48,000 FC/60,000 FH
A330–200, –300 Series (except WV050 family) (non enhanced) [36].	40,000	40,000 FC/60,000 FH
A330–200, –300 Series WV050 family (enhanced) [36]	40,000	33,000 FC/100,000 FH
A330–200 Freighter Series	None provided	NOTE [38]
A340–200, 300 Series(except WV 027 and WV050 family) (non enhanced) [37].	20,000	20,000 FC/80,000 FH
A340–200, 300 Series WV 027 (non enhanced) [37]	20,000	30,000 FC/60,000 FH
A340–300 SeriesWV050 family (enhanced) [37]	20,000	20,000 FC/100,000 FH
A340–500, 600 Series (all models) [37]	20,000	16,600 FC/100,000 FH
A380–800 Series (all models)	None provided	NOTE [39]
Boeing:		
Boeing 707 (–100 Series and –200 Series)	20,000	Excluded per § 26.21(g)
Boeing 707 (–300 Series and –400 Series)	20,000	Excluded per § 26.21(g)
717 (all models)	60,000	60,000 FC/60,000 FH
Boeing 720	30,000	Excluded per § 26.21(g)
727 (all models)	60,000	60,000 FC
737 (Classics): 737–100, –200, –200C, –300, –400, –500 [40]	75,000	75,000 FC
737 (NG): 737–600, –700, –700C, 800, 900 [40]	75,000	75,000 FC
737–900ER	None provided	75,000 FC
747 (Classics): 747–100, –100B, –100B SUD, –200B, –200C, –200F, –300, –747SP, 747SR [41].	20,000	20,000 FC
747–400: 747–400, –400D, –400F [41]	20,000	20,000 FC
757 (all models)	50,000	50,000 FC
767 (all models)	50,000	50,000 FC
777–200, –300 [42]	44,000	40,000 FC
777–200LR, 777–300ER [42]	44,000	40,000 FC
777F	None provided	11,000 FC
Bombardier:		
CL–44D4 and CL–44J	20,000	Excluded per § 26.21(g)
CL–600: 2D15 (Regional Jet Series 705), 2D24 (Regional Jet Series 900).	None provided	60,000 FC
British Aerospace Airbus, Ltd.:		
BAC 1–11 (all models)	85,000	Excluded per § 26.21(g)
British Aerospace (Commercial Aircraft) Ltd.:		
Armstrong Whitworth Argosy A.W. 650 Series 101	20,000	Excluded per § 26.21(g)
BAE Systems (Operations) Ltd.:		
BAE 46 (all models) and Avro 146 RJ70A, RJ85A and RJ100A (all models).	50,000	Excluded per § 26.21(g)
Embraer:		
ERJ 170 (all models)	None provided	NOTE [43]
ERJ 190 (all models)	None provided	NOTE [44]
Fokker:		
F.28 Mark 70, Mark 100 (all models)	90,000	90,000 FC
Lockheed:		
300–50A01 (USAF C 141A)	20,000	Excluded per § 26.21(g)
L–1011 (all models)	36,000	36,000 FC
188 (all models)	26,600	26,600 FC

FIGURE 3—COMPARISON OF NPRM DESIGN AND EXTENDED SERVICE GOALS AND FINAL RULE DEFAULT LOVS—Continued

Airplane model	NPRM table 3	Final rule §§ 121.1115 and 129.115 table 1
	Design and Extended Service Goals (flight cycles)	Default LOVs [flight cycles (FC) or flight hours (FH)]
382 (all models)	20,000	20,000 FC/50,000 FH
1649A–98	20,000	Excluded per § 26.21(a)
1049–54, 1049B–55, 1049C–55, 1049D–55, 1049E–55, 1049F–55, 1049G–8249–46, 149–46, 649–79, 649A–79.	20,000	Excluded per § 26.21(a)
749–79, 749A–79	20,000	Excluded per § 26.21(a)
McDonnell Douglas:		
DC–6 [45]	20,000	Excluded per § 26.21(a)
DC–6A (all models) [45]	20,000	Excluded per § 26.21(a)
DC–6B (all models) [45]	20,000	Excluded per § 26.21(a)
DC–7 (all models) [45]	20,000	Excluded per § 26.21(a)
DC–8, –8F (all models)	50,000	50,000 FC/50,000 FH
DC–9 (all models)	100,000	100,000 FC/100,000 FH
MD–80 (all models)	50,000	50,000 FC/50,000 FH
MD–90 (all models) [46]	60,000	60,000 FC/90,000 FH
DC–10–10, –15 (all models)	42,000	42,000 FC/60,000 FH
DC–10–30, –40, –10F, –30F, –40F (all models)	30,000	30,000 FC/60,000 FH
MD–10–10F (all models)	42,000	42,000 FC/60,000FH
MD–10–30F (all models)	30,000	30,000 FC/60,000 FH
MD–11, –11F (all models)	20,000	20,000 FC/60,000 FH
Airplanes with Maximum Takeoff Gross Weight Changes:		
All airplanes whose maximum takeoff gross weight has been decreased to 75,000 pounds or below after January 14, 2011 or increased to greater than 75,000 pounds at any time by an amended type certificate or supplemental type certificate.	Design service goals and extended service goals for airplanes whose weight has been changed are unknown.	There are no default LOVs for airplanes whose weight has been changed.

[32] Listed as A300 B2–1A, B2–1C and B2K–3C in the NPRM.
[33] Listed as A300 B4–2C and B4–103 in the NPRM.
[34] Listed as A300 B4–600 Series, B4–600R Series, and F4–600R Series in the NPRM.
[35] Listed as A320 (all models) in the NPRM.
[36] Listed as A330 (all models) in the NPRM.
[37] Listed as A340 (all models) in the NPRM.
[38] Airplane operation limitation is stated in the Airworthiness Limitation section.
[39] Airplane operation limitation is stated in the Airworthiness Limitation section.
[40] Listed as Boeing 737 in the NPRM.
[41] Listed as Boeing 747 in the NPRM.
[42] Listed as Boeing 777 in the NPRM.
[43] Airplane operation limitation is stated in the Airworthiness Limitation section.
[44] Airplane operation limitation is stated in the Airworthiness Limitation section.
[45] Airplane certificated before 1958.
[46] Listed as MD–90–30 in the NPRM.

b. Table 2—Airplanes excluded from § 26.21

Section 26.21 specifically excludes models of airplanes from today's rule if no airplanes of that model are operating under part 121 or 129. Today's revisions to parts 121 and 129 requiring that operators incorporate LOVs into their structural maintenance programs include applicability to operators of airplanes that have been excluded under § 26.21 should the operator later decide to operate one of them.

In the NPRM, the FAA proposed excluding airplanes not operated under part 121 or 129. The agency proposed exclusion from the rule for:

- Bombardier BD–700.
- Gulfstream GV.
- Gulfstream GV–SP.
- British Aerospace, Aircraft Group, and Societe Nationale Industrielle Aerospatiale Concorde Type 1.

The FAA requested comments on the feasibility and benefits of including or excluding these airplanes. The agency also requested comments on the feasibility of including or excluding any other transport category airplanes with a maximum takeoff gross weight greater than 75,000 pounds from the requirements of this provision, whether or not they are operated under part 121 or 129.

Several commenters disagreed with the applicability of the rule, as proposed. The National Transportation Safety Board recommended that the final rule also apply to airplanes operated under part 135 because they may be at equal or greater risk of developing WFD compared to those operated under parts 121 or 129.

An individual commenter suggested that the FAA delete the list of airplanes proposed for exclusion because it gives preferential treatment to certain airplanes. This commenter added that an operator had planned to use Gulfstream GV airplanes for part 121 operations but chose not to do so only for financial reasons. If an operator did decide to operate an excluded airplane under part 121 or 129, said the commenter, there would be no operational limit and no associated maintenance actions to preclude WFD in that airplane. Although this commenter did not support having a list of excluded airplanes in the rule, he suggested—based on the agency's stated rationale in the NPRM—that we add the following airplanes to the list:

- The Douglas DC–6, DC–6A, and DC–7.
- The Lockheed 049, 149, 649, 749, 1049, 1649, 188, 300, and 382.
- The Boeing 707 and 720.

We have reconsidered our rationale for the list of excluded airplanes proposed in the NPRM. Those airplanes have a maximum takeoff gross weight greater than 75,000 pounds but are not currently operating under part 121 or 129. Therefore, there is no reason to require the design approval holders to establish LOVs for them. We have decided to retain on the list the models originally proposed for exclusion from the rule and, in response to comments, and to be consistent with other aging airplane rules, have added other models which are not operated under part 121 or 129. The complete list is shown below.

(1) Bombardier BD–700.
(2) Bombardier CL–44.
(3) Gulfstream GV.
(4) Gulfstream GV–SP.
(5) British Aerospace, Aircraft Group, and Societe Nationale Industrielle Aerospatiale Concorde Type 1.
(6) British Aerospace (Commercial Aircraft) Ltd., Armstrong Whitworth Argosy A.W. 650 Series 101.
(7) British Aerospace Airbus, Ltd., BAC 1–11.
(8) BAE Systems (Operations) Ltd., BAe 146.
(9) BAE Systems (Operations) Ltd., Avro 146.
(10) Lockheed 300–50A01 (USAF C141A).
(11) Boeing 707.
(12) Boeing 720.
(13) deHavilland D.H. 106 Comet 4C.
(14) Ilyushin Aviation IL–96T.
(15) Bristol Aircraft Britannia 305.
(16) Avions Marcel Dassault-Breguet Aviation Mercure 100C.
(17) Airbus Caravelle.
(18) D & R Nevada, LLC, Convair Model 22.
(19) D & R Nevada, LLC, Convair Model 23M.

The FAA recognizes that it is possible—as suggested by the individual commenter—that in the future an operator could decide to operate an "excluded" airplane under part 121 or 129. Therefore, in this final rule §§ 121.1115 and 129.115 are revised to provide that no airplane listed in § 26.21 can be operated under part 121 or 129 unless an LOV for the airplane has been incorporated into the operator's structural maintenance program. The operational rules state that, in the absence of an approved LOV, the operator must incorporate the applicable default LOV specified in Table 2 of either §§ 121.1115 or 129.115. Those default LOVs are based on Table 3 of the NPRM. As stated in the NPRM, Table 3 used design service goals and extended service goals that were based on information from design approval holders or on a conservative estimate by the FAA. It did not include the Comet 4C, IL–96T, Britannia 305, Mercure 100C, Caravelle, Convair Model 22, or Convair Model 23M. To develop those default LOVs, the FAA treated flight-cycle or flight-hour data that was available for those airplanes as fatigue test data and reduced it by a factor of two. This approach is based in part on AC 25.571–1X for new airplanes.

6. Bombardier Airplanes

Bombardier asked for clarification of the applicability of the proposed rule to several of its models and their derivatives. Specifically, the company asked about the following airplanes:

Models CL 600 Challenger 870 and 890: Bombardier asked whether they should be added to the list of excluded airplanes in proposed § 25.1807(i).

The CL 600 Challenger 870 and 890 do not currently have type certificates issued by the U.S. Therefore, there are no N-registered airplanes operating under either part 121 or 129. As a result, this final rule does not apply to them at this time. However, if Bombardier were to apply for a U.S. type certificate before the effective date of this final rule, the company would have to comply by the compliance date in § 26.21. Even if Bombardier were to apply after the effective date of the rule, the company would be subject to requirements of § 26.21 because the Bilateral Aviation Safety Agreements (BASA) [47] with Canada allow the U.S. to impose additional requirements in the interest of safety. Other airplanes in similar circumstances would be handled in the same way.

Model CL 600 derivatives—RJ 701 ER, RJ 701 LR, all RJ 705 airplanes, and all RJ 900 airplanes: Bombardier noted that Table 3 in the NPRM, titled Design and Extended Service Goals, does not list these models.

The CL 600 derivatives RJ 705 and RJ 900 were inadvertently left off Table 3 of the NPRM. This final rule applies to Bombardier models RJ 705 series and RJ 900 series because their maximum takeoff gross weight is greater than 75,000 pounds, and they are operated under part 121 or 129. They have been added to Table 1, which is the applicability table for this final rule. Today's rule does not apply to Bombardier RJ 701 series airplanes because their maximum takeoff gross weight is not greater than 75,000 pounds.

[47] Agreement between the Government of the United States of America and the Government of Canada for Promotion of Aviation Safety, June 12, 2000.

Model CL 44: These airplanes were previously exempted from the other aging airplane rules, both proposed and final, on the basis of their age and the very small number remaining in service.

Bombardier Model CL 44 is not operated under either part 121 or 129 and, therefore, the FAA has revised the list of excluded airplanes in § 26.21 of today's rule to include Bombardier Model CL 44.

7. Intrastate Operations in Alaska

Lynden Air Cargo requested that the NPRM pertaining to WFD be withdrawn in its entirety. Alternatively, the commenter requested that Lockheed Model 382 airplanes be excluded from the rule and that all air carriers engaged in intrastate operations in Alaska be excluded. In support of this request, the commenter gave the following reasons:

- There is no replacement airplane with the necessary lift and operational characteristics.
- The L–382 airplanes are not used to carry passengers.
- It is in the public interest to maintain the unique capabilities of the L–382 in Alaska where it supports remote communities and projects with no roads or waterways and supports the U.S. military during critical campaigns and the ongoing war on terrorism.

Lynden Air Cargo also asked that it be excluded from § 121.909.

Senator Murkowski of Alaska and the late Senator Stevens stated that the rule, as proposed, would have severe consequences to residents and cargo carriers operating in that State. Senator Stevens referred to Section 1205 of the Federal Aviation Reauthorization Act of 1996 (49 U.S.C. 40113(f)), which requires that—when modifying regulations affecting intrastate aviation in Alaska—the FAA consider the extent to which Alaska is not served by transportation modes other than aviation. Accordingly, Senator Stevens requested that the FAA exempt all intrastate operations in Alaska and the interstate operations of the six Lockheed L–382G airplanes operated by Lynden Air Cargo. The senator pointed out that the L–382G is out of production and there is no suitable replacement available.

Several other commenters addressed operational limits for Lockheed Models L–382E and G, although they did not discuss operation of these airplanes in Alaska. Specifically, Transafrik International asked that Lockheed Models L–382E and G be removed from Table 3 or that their operational limit be increased to at least 60,000 cycles. The commenter added that the airplanes are no longer in production and there is no replacement airplane able to take off and land on short, unimproved runways with the payloads required. A comment from Lockheed Martin estimated—based on certain inspections and modifications which it had performed on the outer and center wing structure—that the LOV for the Lockheed Model L–382 is 50,000 flight hours but would no doubt be changed to at least 75,000 flight hours, to accommodate usage in the fleet. Lockheed Martin also identified maintenance actions that should be performed on the wing structure to operate to that limit. The commenter stated that, regardless of any FAA decision on implementation of the rule, the company will continue to ensure that operators of Lockheed Model L–382 model aircraft are provided with inspection procedures and replacement actions that effectively mitigate the risk of failure due to WFD.

Consistent with 49 U.S.C. 40113(f), the FAA has carefully considered the potential impact of this rulemaking on Alaska intrastate operators to determine whether intrastate service in Alaska would be adversely affected. Airplanes to which this final rule is applicable are not operated solely in intrastate commerce in Alaska. Therefore, contrary to the commenters' assertions, the FAA has determined that there would not be an adverse effect on intrastate air transportation in Alaska and that regulatory distinctions are not appropriate.

The Lockheed L–382G operated by Lynden Air Cargo is operated under 14 CFR part 121, Operating Requirements: Domestic, Flag, and Supplemental Operations and operates interstate as well as to foreign destinations. The FAA has decided against excluding the L–382G from requirements of §§ 121.1115 and 129.115 for those airplanes in interstate operation. The safety rationale for these rules applies equally to that airplane. In accordance with 14 CFR part 11, Lynden Air Cargo may submit a petition for exemption from those rules. Such a petition must state (1) why granting such an exemption would be in the public interest and (2) why a grant of exemption would not adversely affect safety or how it would provide a level of safety equivalent to the regulation.

Regarding Lynden Air Cargo's request for exclusion from § 121.909, that requirement, which was formerly designated as § 121.370(a), has been in effect since November 1, 2002.[48] The FAA has not made any changes to that rule other than changing its section number.

[48] 67 FR 72726, December 6, 2002.

The FAA encourages Transafrik and Lynden Air Cargo as well as other operators of Model L–382G to work with Lockheed Martin regarding the establishment of the LOV for the model.

8. Composite Structures

The Modification and Replacement Parts Association (MARPA) and Airbus asked that the FAA clarify applicability of the rule to structure made of composite materials, and MARPA recommended that composite structure should be treated the same as metallic structure.

There is an increasing trend for manufacturers to use composite materials to build airplanes. This structure wears differently than metallic structure. For example with metallic structure, repeated loads or environmental exposure cause fatigue cracking or corrosion. With composite structure, repeated loads or environmental exposure cause general degradation (such as cracking, delamination, and oxidative breakdown of the resin) and accumulation of local damage (such as wearing out of fastener holes and handling damage, or water ingression between composite layers, followed by freeze-thaw cracking of the core).

The FAA issued AC 20–107B to provide guidance for certifying composite structures, including guidance for evaluating composite structure relative to the damage tolerance requirements of § 25.571.

The objective of this final rule is to address the normal fatigue wear out of metallic structure. Although the trend in industry is to use composite structure as much as possible, a significant percentage of a new airplane may still be built of metal. Full-scale fatigue test evidence would be necessary to demonstrate that WFD will not occur in metallic structure of the airplane. It would also be necessary for the design approval holder for the airplane to develop an LOV to limit the operation to the point in time up to which it has been demonstrated that WFD will not occur in the airplane's metallic structure.

The FAA will continue to evaluate whether rulemaking is necessary to address the normal wear of composite structures.

K. Harmonization

A number of commenters, including industry representatives on the AAWG, FedEx, Boeing, Embraer, the National Air Cargo Association (NACA), AWAS, and Airbus noted that the WFD NPRM has not been harmonized with the European Aviation Safety Agency (EASA), which has issued Notice of Proposed Amendment (NPA) 05–2006 on this subject, and other national aviation authorities. The commenters pointed out that the Initial Regulatory Evaluation did not consider the cost of failing to harmonize the rule with other airworthiness authorities. Airbus also questioned whether the evaluation addressed costs associated with importing into the United States airplanes that have not complied with the rule, especially if the rule is not harmonized with other airworthiness authorities.

They recommended that the FAA harmonize the rule with those authorities before issuing it. According to the commenters, lack of harmonization could cause the following problems:

1. It could create a significant challenge to future certification projects, encouraging unilateral and possibly arbitrary certification activities.
2. There could be a substantial negative economic impact with respect to the transfer, lease, or sale of aircraft between the U.S. and other countries. Commenters suggested that bilateral agreements be amended to support the transfer of used aircraft subject to the final rule.
3. The FAA and EASA could have different approaches to WFD.
4. Type certificate holders from other countries may not be given the same priority and allocation of FAA resources as are type certificate holders from this country, resulting in delayed approval for applications from other countries.

Boeing, EASA, and Airbus requested that the FAA include the requirement to evaluate certain repairs, alterations, and modifications to align its requirements with those being proposed by EASA.

The FAA is working closely with EASA and other national airworthiness authorities to harmonize this final rule as much as possible. On April 25, 2006, EASA published NPA 05–2006, entitled Ageing Aeroplane Structures. That notice proposed technical guidance to be used for developing programs for continuing structural integrity, to ensure that the structure of aging airplanes is adequately maintained throughout their operational lives. Among other things, the notice proposed guidance for addressing WFD in existing airplane models. The FAA has provided comments on that proposed rulemaking. EASA is considering our comments and has discussed them with us.

Many of the changes made to our proposed rule will facilitate harmonization with national airworthiness authorities. Some of these changes are the following:

1. The design approval holder requirements proposed in the NPRM as part 25, subpart I, are now contained in a new part 26 to harmonize more easily with the regulatory structure of other national airworthiness authorities.

2. This final rule uses the term "limit of validity" rather than "initial operational limit" to align more closely with other national airworthiness authorities.

3. This final rule uses compliance dates that specify a phased approach for establishing the LOV for existing airplane models. NPA 05–2006 links compliance dates to design service goals. As discussed above, the FAA has concluded that the latter approach creates unnecessary complexity and uncertainty. We have submitted comments about this matter to EASA and are in discussions about it. In terms of establishing an LOV, the technical guidance in AC 120–YY is consistent with EASA's technical guidance in NPA 05–2006.

4. With respect to removal of requirements pertaining to repairs, alterations, and modifications, the FAA is working closely to harmonize this final rule with the rule EASA is developing but has not yet published for public comment.

5. Finally, the changes to § 25.571 are based on a recommendation of the General Structures Harmonization Working Group of ARAC. Development of the October 2003 recommendation pertaining to WFD involved harmonization between U.S. and European requirements.

L. The Regulatory Evaluation for the NPRM

The estimated present value cost of this final rule is about $3.6 million, while the estimated present value cost of the NPRM was estimated to be about $360 million. The estimated benefits of this final rule are worth $4.8 million in present value and are based on managing WFD with maintenance actions developed under this final rule versus the current practice of issuing airworthiness directives as WFD is found. The estimated present value benefits of the NPRM consisted of $726 million of accident prevention benefits and $83 million of detection benefits for total benefits of $809 million.

We received many comments regarding the validity of the regulatory evaluation of the proposed rule on WFD. In general, commenters stated that the potential benefits of the rule seemed to be overstated, and the potential costs seemed to be understated. Therefore, commenters challenged the conclusion that the benefits of the rule justify the costs. The commenters included Lockheed Martin, Boeing, Airbus, Bombardier, NACA, the CAA, ATA, FedEx, United Parcel Service, AWAS, American Airlines, Lynden Air Cargo, industry representatives on the AAWG, and an individual commenter.

1. Benefits of Proposed Rule

Some commenters questioned how a benefit of $726 million could be attributable to accident prevention when there have been no accidents related to WFD since the Aloha Airlines accident in 1988. The NACA and other commenters also argued that the regulatory evaluation makes a false assumption when it defines the cost benefit number for avoiding fleet grounding. Finally, the ATA and several other commenters suggested that projected benefits would decrease if the regulatory evaluation were updated to include data from the years 1974 through 1983 and 2000 through 2005.

Today's rule establishes a consistent approach to management of aging airplanes so that they are not operated to the point where WFD occurs. Thus the potential benefit of the rule is preventing catastrophic structural failure in flight that could result in loss of lives and loss of the airplane. Other benefits of the rule are costs avoided under the current system. Relying on the issuance of airworthiness directives to address WFD—whenever it happens to be discovered—causes unscheduled down time. The issuance of emergency airworthiness directives and immediately adopted rules may result in the unscheduled removal from service of a fleet of airplanes.

This final rule requires a design approval holder to establish an LOV for an airplane that reflects the fatigue characteristics of the airplane structure. If the WFD evaluation determines that maintenance actions are necessary to reach this LOV, the FAA would adopt them through the normal airworthiness directive process, allowing opportunity for notice and comment and accomplishment of required actions during scheduled maintenance. As such, the costs of these maintenance actions would be lower than if the FAA adopted emergency airworthiness directives or immediately adopted rules mandating the same actions as a result of in-service occurrences of WFD. As discussed below, the FAA expects very few airplanes to be retired solely because they reach their LOV. We have also taken this into account.

Our revised regulatory evaluation lists three benefits of the rule, namely

(1) Prevention of accidents;

(2) Extension of the economic life of the airplane with corresponding revenues from that additional economic life; and

(3) Near elimination of emergency airworthiness directives pertaining to WFD, which significantly reduces downtime associated with urgent unscheduled maintenance. The quantified benefit of the final rule is based solely on this third benefit, which is valued at $9.8 million or, evenly distributed over 20 years, a present value of approximately $4.8 million.

2. Costs of Proposed Rule

a. Need To Know LOVs To Determine Cost

Some commenters stated that, if the operational limit for each airplane model were not known, then the cost of the rule could not be determined.

In our Initial Regulatory Evaluation, the agency estimated the costs of initial operational limits to operators by using the design service goal for each airplane model as the initial operational limit. Those cost estimates would be expected to be higher than estimates based on LOVs that design approval holders anticipate establishing because in most cases, these LOVs are expected to exceed the design service goals. During the comment period, manufacturers provided the LOVs that they anticipate they will be establishing under today's rule. Those LOVs were 33% to 180% higher than the airplane's design service goal. Accordingly, our analysis in the Final Regulatory Evaluation uses these anticipated LOVs and indicates a lower cost to operators than was initially projected.

Airbus stated that not all of its models will have LOVs from 33% to 180% beyond the airplane's design service goal. Airbus will have LOVs for some models that will be equal to the airplane's design service goal. Although some of Airbus's LOVs are equal to the design service goal, which makes the LOVs span a shorter time, we still do not anticipate that any Airbus airplanes will need to be retired during the 20-year analysis period as a result of this final rule.

FedEx, Northwest Airlines, and ATA argued that operator cost estimates are not credible if they are based on anticipated LOVs instead of LOVs that have been accepted by the FAA and industry. It is for this reason that FedEx further argued that an operational rule must be proposed after the design approval holder's LOVs have been approved by the FAA. This would also, noted the commenter, provide the public with the opportunity to comment on those LOVs.

The FAA measures the economic loss to operators of retiring an airplane at LOV instead of at a planned future retirement date. The FAA considers that this is a reasonable way to estimate compliance costs and that, ultimately, the LOVs that are accepted by the FAA and industry will be very close to those anticipated LOVs that the FAA has received from industry and used for these estimates of cost.

b. Need To Know Maintenance Actions To Determine Cost

Some commenters suggested that the costs associated with maintenance actions to preclude WFD prior to reaching the LOV either could not be determined or were substantially underestimated because the actions were not yet developed. Other commenters indicated that costs used in the regulatory evaluation do not accurately reflect operators' costs. They said, for example, that estimates of the number of hours needed to accomplish inspections, the number of inspections needed in a maintenance visit, and the number of days an airplane is out of service to accomplish maintenance did not reflect the actual experience of operators. Boeing added that the overall cost of the rule is difficult to determine because there will be costs related to maintenance actions required by airworthiness directives.

Although this final rule allows design approval holders to establish LOVs without relying on maintenance actions, the FAA expects most design approval holders will adopt LOVs that rely on such actions. As discussed in the NPRM, design approval holders are not required to identify and develop maintenance actions if they can show that such actions are not necessary to prevent WFD before the airplanes reach the LOV. As discussed in the Final Regulatory Evaluation, the FAA anticipates that at least Boeing will propose LOVs that will depend upon accomplishment of future maintenance actions. This is consistent with Boeing's current practice of developing service information that defines the maintenance actions to address WFD in its products. However, any maintenance actions necessary to reach the LOV will be mandated by airworthiness directives through separate rulemaking actions, so their costs are not attributable to this final rule. This is also consistent with the current practice of issuing airworthiness directives to address unsafe conditions associated with WFD. The FAA will provide cost estimates when issuing the airworthiness directives for any maintenance actions necessary to prevent WFD.

The FAA recognizes that this final rule is unusual in that it may depend upon future rulemaking to fully achieve its safety objectives. In the context of WFD, this approach is necessary to enable design approval holders to propose LOVs that allow operators the longest operational lives for their airplanes, while still ensuring freedom from WFD. This approach allows for an implementation strategy that provides flexibility to design approval holders in determining the timing of service information development (with FAA approval), while providing operators with certainty regarding the LOV applicable to their airplanes. The FAA has issued many airworthiness directives in the past to address WFD issues, and the agency anticipates that the approach adopted today will interface smoothly with existing practices for issuing airworthiness directives.

In this regard, this final rule is similar to SFAR 88, which also required design approval holders to perform technical evaluations (in that case, of fuel tank ignition sources) and to develop necessary maintenance actions that would be mandated by airworthiness directive. To date, the FAA has issued over 100 airworthiness directives to address unsafe conditions identified as a result of SFAR 88. These airworthiness directives were issued based on this proactive approach of requiring analyses to identify unsafe conditions, rather than relying on service experience to identify them, with potentially catastrophic results. In the context of SFAR 88, this approach has been generally recognized as being effective. The objective of this final rule is to establish a similar proactive approach that will enable us to issue any necessary airworthiness directives before WFD results in potentially catastrophic structural failure.

c. Costs to Manufacturers

Airbus indicated that, considering the significant number of hours necessary to train enough engineers and then to comply with the rule, the Initial Regulatory Evaluation substantially underestimated the costs of this rulemaking for manufacturers. Airbus said that the cost of future LOV extensions should be included. Based on further discussion to identify these costs, Airbus and the FAA agreed that Airbus currently meets the intent of today's rule by performing an evaluation of structure susceptible to fatigue and establishing an LOV prior to the development of WFD. The rule does not require manufacturers to extend LOVs—thus these extensions are not a compliance cost. The FAA does understand that LOV extensions are part of the existing Airbus business practice.

Boeing stated that the most significant costs will be borne by the manufacturer rather than the operator. When the manufacturer has to perform additional fatigue testing to substantiate an operational limit, said the commenter, the costs could be quite significant. Based on further discussion to identify these costs, Boeing and the FAA agreed that, because Boeing is also already engaged in the activities required by this final rule, its additional costs will be minimal.

A later Boeing comment, however, said that the regulatory evaluation summarized in the Technical Document, which was developed by the FAA for the public meeting, does not identify future expenses the Boeing Company will incur. Boeing believes this discounting is not correct because the company still has substantial work to do in providing maintenance programs for repairs and alterations, and in developing LOVs and supportive maintenance actions for post-Amendment 25–45 airplanes. Boeing said that the costs of an airworthiness directive are being attributed to operators, but do not account for manufacturers' costs. A second point made by this commenter was that certain LOVs may be set at a point lower than hoped, simply because the maintenance actions needed to bring that LOV out to a more distant point may be too technically difficult and costly to perform. This could result in a considerable amount of engineering work for Boeing to develop the LOV that, because the maintenance actions are never released, might not result in recompense for Boeing. Boeing said that we are presenting costs as either voluntary compliance for setting LOVs or as airworthiness directive costs for developing maintenance actions.

In discussions, Boeing has informed us that the company will voluntarily do this work to address WFD in its airplanes, with or without the rule. As a result, the rule does not impose costs, and the regulatory evaluation properly does not assign costs to Boeing's voluntary compliance. The rule does not require that design approval holders develop maintenance actions to be performed to support the LOV, nor does the rule require development of LOVs for repairs, alterations, and modifications. If the LOV developed by the design approval holder does specify maintenance actions, the FAA will separately estimate the costs of those maintenance actions at the time as part of the airworthiness directive notice. Any work done on repairs, alterations, and modifications, because it is not required by the rule, is not accounted for as a cost of the rule. Compliance costs are assumed to be borne by the operators. If manufacturers have incurred costs in developing the maintenance actions for operators to reach LOV, there is nothing that precludes them from being recompensed for that work. The FAA based the analysis of costs in our Initial Regulatory Evaluation on discussions with the AAWG. Because this final rule is significantly different from the NPRM, the agency has re-evaluated these costs, and the results are reflected in the Final Regulatory Evaluation.

d. Cost of Failing To Harmonize Rule

Industry representatives on the AAWG, Airbus, Boeing, and the ATA pointed out that the regulatory evaluation did not consider the cost of failing to harmonize the rule with other airworthiness authorities. Commenters suggested that—if the rule were not harmonized—there would be a substantial negative economic impact with respect to the transfer, lease, or sales of airplanes between the U.S. and other countries. Commenters suggested that bilateral agreements be amended to support the transfer of used airplanes subject to this final rule.

As discussed in section III.K. above, the FAA is working closely with EASA and other national airworthiness authorities to harmonize this final rule as much as possible. Many of the changes to the proposed rule will facilitate such harmonization.

e. Cost To Replace an Airplane

A number of commenters said that the initial regulatory evaluation used replacement costs that are not accurate or justified. According to the ATA, "The assumptions used in the regulatory evaluation ignore the reality that some airlines replace their fleets with new aircraft in most cases, while others (particularly cargo carriers) depend on used aircraft with long remaining lives to support their particular business case." In a related vein, Airbus, the ATA, and an individual commenter said that the regulatory evaluation failed to consider the significant cost to operators of retiring airplanes. Of particular concern was the situation where airplanes that support an operation reach their operational limit, and there are no new airplanes which could fill the same role. The ATA said that the regulatory evaluation ignores factors that operators would take into account when deciding whether to retire an airplane or to seek approval of an extended operational limit but did not define those factors.

In the public meeting on December 11, 2008, a commenter representing United Parcel Service noted that the cost benefit analysis was based only on Boeing airplanes, and said that if the Airbus airplanes were included, there would be one airplane model with an LOV that is actually less than the design service goal in the original NPRM. United Parcel Service commented that operators of those airplanes would be interested in understanding how that economic impact to the residual value of those airplanes was not included in the cost. United Parcel Service also asked, since Boeing had expressed discomfort with the use of the anticipated LOV information that it had originally given the FAA, how the FAA could be comfortable using that information for the regulatory evaluation. Since the public meeting, Boeing has provided updated information about anticipated LOVs for their airplanes. Airbus has provided a table containing updated information on certain Airbus model LOVs and anticipated extensions to LOVs. The FAA uses this updated information in the Final Regulatory Evaluation.

Lynden Air Cargo said that the initial regulatory evaluation did not provide a true economic impact for either design approval holders or operators because it is based upon unknown facts from too few design approval holders and with no input from operators, who will bear 90% of the costs. Lynden Air Cargo provided flight cycle and flight hour data for its L–382G airplanes. Based on an LOV of 75,000 flight hours, Lynden Air Cargo stated that issuance of the "anticipated LOVs," which are included in the Technical Document, would require that Lynden Air Cargo immediately retire three of its six airplanes and, at the Lynden Air Cargo current utilization rate, retire the other three by approximately December 2019. Lynden Air Cargo estimates the cost to replace its six airplanes would range from $120 million to $810 million, if comparable airplanes were available.

Lockheed indicated that the LOV anticipated for the L–382 would be based only on flight hours. Based on flight hours, usage, and current ownership, we do not estimate that any L–382 airplanes will be retired in our 20-year analysis period. Lockheed stated that it will continue to support the L–382 model regardless of whether the FAA issues a WFD rule.

In developing the Final Regulatory Evaluation, the FAA used a commercial fleet data product that identifies the status of airplane hours and cycles. The FAA found only one U.S.-registered airplane currently operating under part 121 with a number of flight cycles exceeding the anticipated LOV for the airplane and only five U.S.-registered airplanes operating under part 121 that exceed 80% of those LOVs.

The economic cost of requiring retirement of an airplane at the anticipated LOV is a central issue in the cost estimate for today's rule. Common business practice is to value assets at the current market value, and the FAA follows this practice in the Final Regulatory Evaluation. In the case of airplanes at or near the end of their commercial lives, this value is quite small. Assigning a cost of purchasing a new airplane to replace an airplane at LOV would be a serious overstatement because it ignores the decline in value as airplanes age.

f. Residual Value of Airplanes

Several commenters, including the ATA, FedEx, United Parcel Service, Airbus, the CAA, Technical Data Analysis, Inc., and Celeris Aerospace of Canada, stated that the initial regulatory evaluation did not consider the impact of the proposal on loans, leases, and residual value of airplanes. They said the rule would have a particularly significant effect on cargo operations, which tend to use older airplanes.

These comments are based on an assumption that LOVs will be established at levels below where significant numbers of airplanes would otherwise be retired.

As discussed previously, the vast majority of airplanes are currently retired well before the LOVs that design approval holders anticipate establishing under this final rule. These retirements are for economic reasons unrelated to today's rule. The FAA expects that future retirement decisions will be made for similar reasons and that this final rule will force retirement of only one airplane that is otherwise reaching the end of its commercial operational life.

We use an appraiser-estimated airplane value when the airplane reaches LOV before retirement. This estimate properly reflects the true value of the asset. To include any other cost estimate would be double counting.

3. "Rotable" Parts

Northwest Airlines commented that it is not clear whether or not airplane life limits (the commenter's term for LOVs) extend to components, such as engine nacelles, passenger and cargo doors, flight controls, and wing-to-body fairings. These components can be "swapped out," or rotated (they're known in the industry as rotable parts) from one airplane to another. Northwest Airlines said that there is a potential for significant costs associated with rotable parts if they are limited by an airplane's LOV. Operators typically do not track the number of accumulated flight cycles or flight hours for them. Northwest Airlines stated that operators may have to assume the flight cycles or flight hours on affected rotable parts to be equal to the world high-time airplane for that model. This may require that operators ground many airplanes or scrap rotable parts, resulting in significant costs that have not been captured in the regulatory evaluation included in the Technical Document.

The LOV is an airplane-level number. The FAA does not anticipate that rotable parts will be identified by design approval holders as structure susceptible to WFD. This is because the parts typically considered as rotable do not have structural details and elements that are repeated over large areas and operate at the same stress levels. AC 120–YY provides examples of structure in which multiple site damage or multiple element damage could occur. Rotable parts are not included in those examples. As a result, we have determined that rotable parts do not affect the cost of this final rule.

4. Use of LOVs for Financial Evaluations

Airbus expressed concerns similar to those expressed by Boeing and the members of AAWG about lack of uniformity in the manner in which various manufacturers are setting LOVs. The commenter also stated that it was important that the LOVs, and the LOV flight hour or flight cycle numbers, not be used by non-technical people in the finance community to set depreciation schedules, commercial valuations, comparisons, and competitive arguments. Airbus was concerned that such use of non-standardized data could lead to market distortion.

Airbus requested that we not publish LOV tables for each manufacturer's product lines in the rule and its preamble. It stated that this information would much more appropriately be published and updated in the manufacturer's Instructions for Continued Airworthiness for each airplane. Airbus suggested that, if the FAA nevertheless decides that publishing such LOV tables is necessary, then it would be important to develop, in concert with industry, the definitions, criteria, and methodologies to be used, so that resulting LOVs from all sources are consistent.

The FAA has revised the rule to ensure that there is an objective, performance-based standard for developing LOVs, and AC 120–YY has been updated to provide guidance in complying with those standards. The reason that design approval holders may appear to be arriving at different LOV numbers is largely a function of the age of their respective fleets. A design approval holder whose fleet is older will have a much larger body of service experience on which to confidently base an LOV. A design approval holder with a younger fleet might be more conservative when first setting an LOV, because there is not as much service experience data on which to base it. Another factor affecting how a design approval holder goes about setting an LOV is how much fatigue testing has been performed on a particular model.

The FAA appreciates that Airbus supports the intent of the WFD rulemaking, and understands Airbus' concern that LOVs could be misinterpreted by those who "set or approve" the economic life of an airplane. The FAA does not expect, nor intend, the LOV in the WFD final rule to set the economic life of an airplane. The March 18, 2009 edition of *Aviation Daily* reported that Airbus has extended the service goals of the A330–200 and A340–200 and –300. The purpose of publishing manufacturers' LOVs in the regulatory evaluation appendix is to provide clarity, transparency, and reproducibility for the economic analysis. As Airbus requested, the reason for the publication of LOVs is clarified in the Final Regulatory Evaluation. In the regulatory evaluation, the FAA states that it is important to note that manufacturers have changed LOVs based on updated information. Airbus, for instance, sets an initial LOV as a declared point for certification purposes. Periodically, as airplanes are shown to be viable for longer lives, design approval holders put programs in place to extend LOVs well before those utilizations are achieved. The FAA believes that manufacturers will continue this practice into the future and update their airplanes' LOVs. Thus the LOVs used in this regulatory evaluation should not be used as a basis for setting the economic life of an airplane. Based upon history, our estimated costs, which were based upon the current LOVs, may be overstated.

IV. Regulatory Notices and Analyses

Paperwork Reduction Act

The Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) requires that the FAA consider the impact of paperwork and other information collection burdens imposed on the public. According to the 1995 amendments to the Paperwork Reduction Act (5 CFR 1320.8(b)(2)(vi)), an agency may not collect or sponsor the collection of information, nor may it impose an information collection requirement, unless it displays a currently valid Office of Management and Budget (OMB) control number.

This final rule will impose the following new information collection requirements. As required by the Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)), the FAA has submitted these information collection amendments to OMB for its review. The Office of Management and Budget approved these new information collection requirements associated with this final rule and assigned OMB Control Number 2120–0743.

Title: Widespread Fatigue Damage.

Summary: Today's rule consists of regulatory changes pertaining to widespread fatigue damage in transport category airplanes. Some of these changes require new information collection. The new information requirements and the persons required to provide that information are described below.

(1) Amendment of part 26 requires that holders of design approvals for certain existing transport category airplanes establish limits of validity (operational limits) for those airplanes. Those design approval holders are also required to revise the Airworthiness Limitations section of the Instructions for Continued Airworthiness (ICA) to include the LOV.

(2) Amendment of part 26 also requires that design approval holders submit to the FAA a plan detailing how they intend to comply with the new requirements. The compliance plan ensures that design approval holders fully understand the requirements, correct any deficiencies in planning in a timely manner, and provide the information needed by the operators for timely compliance with the rule.

(3) Any person operating an airplane under part 121 or 129 is required to revise its maintenance program to incorporate an Airworthiness Limitations section that includes an LOV. Operators would be prohibited from operating an airplane past that limit.

(4) As an option, any person may apply for an extended LOV for affected airplanes. This option has requirements similar to those imposed on design approval holders for establishing an initial LOV. There may be service information developed that would

support the extended limit and would be documented as airworthiness limitation items. To operate beyond the initial LOV, an operator would have to incorporate the extended limit and any airworthiness limitation items pertaining to widespread fatigue damage into its maintenance program.

Use of Collected Information: These requirements support the information needs of the FAA in finding compliance with the rule by design approval holders and operators.

Average Annual Burden Estimate: The burden would consist of the work necessary to:

- Develop or revise the Airworthiness Limitations section of the Instructions for Continued Airworthiness to include the LOV.
- Develop the compliance plan.
- Incorporate the new information into the operator's maintenance program.

Today's rule results in the following annual recordkeeping and reporting burden:

FIGURE 4—RECORDKEEPING AND REPORTING FOR THIS RULE

Documents required to show compliance with the proposed rule	Total labor hours	Total average annual hours	Present value discounted ($2010) cost
FAA-approved revised or new ALS	660	132	$41,674
FAA-approved WFD compliance plan	435	* 435	33,418
FAA-approved maintenance program revision for operators	210	35	12,846
Total	1,305	602	87,938

* This one-time burden will occur in the first 90 days of the compliance period.

The FAA computed the annual recordkeeping burden (in total hours) by analyzing the paperwork needed to satisfy each requirement of the rule. The average cost per hour varies with the number of affected airplanes in each group, the amount of engineering time required to develop the LOV, and the amount of time required for revising the Airworthiness Limitations section of the Instructions for Continued Airworthiness. Other costs associated with the information collection requirements within this rule (in addition to the monetized hourly costs reflected above) are minimal.

In addition to the requirements outlined above, future applicants for either supplemental type certificates or amendments to type certificates that decrease or increase maximum takeoff gross weights would be required to develop a compliance plan for the certification project. The Paperwork Reduction Act compliance for development of these certification plans is covered by a previously approved collection (OMB Control Number 2120–0018) associated with part 21. We estimate the additional burden to include information on a plan for establishing an LOV for these airplanes would be minimal.

International Compatibility

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

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

This portion of the preamble summarizes the FAA's analysis of the economic impacts of this Final Rule. It also includes the final regulatory flexibility determination, the international trade impact assessment, and the unfunded mandates assessment. The FAA suggests readers seeking greater detail read the full regulatory evaluation, a copy of which has been placed in the docket for this rulemaking.

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

In conducting these analyses, FAA has determined this final rule has benefits that justify its costs, and is a "significant regulatory action" as defined in section 3(f) of Executive Order 12866 because it raises novel policy issues contemplated under that executive order. The rule is also "significant" as defined in DOT's Regulatory Policies and Procedures. The final rule, if adopted, however, will not have a significant economic impact on a substantial number of small entities, will not create unnecessary obstacles to international trade and will not impose an unfunded mandate on State, local, or Tribal governments, or on the private sector. These analyses, available in the docket, are summarized below.

Total Costs and Benefits of This Rulemaking

The overriding safety concern of today's rule is WFD-related incidents and accidents that have occurred and the continuing discoveries of WFD problems in the fleet. The current approach does not always find WFD before in-flight events occur. Today's rule will establish the necessary steps to prevent WFD in the future by requiring that design approval holders establish LOVs.

With this final rule, design approval holders may continue their work to provide maintenance actions that support the safe operation of airplanes up to LOV. The FAA would proactively issue airworthiness directives mandating those planned maintenance actions rather than reactively issuing emergency airworthiness directives and immediately adopted rules which require unanticipated inspections and repairs. The FAA estimates that this approach is worth $4.8 million in present value.

In contrast to the NPRM, the final rule total costs are minor. Several significant factors are responsible for the reduction in these costs. First, the final rule does not include the repair, alterations, and modification requirement as in the NPRM. Second, many older airplanes have been retired since the NPRM. Third, due to the comments and conversations with design approval holders, the agency now understands that most LOVs will be set 33% to 180% higher than design service goal rather than at design service goal as was specified in the NPRM. Because of current maintenance programs and voluntary compliance by design approval holders, costs for design approval holders and operators are expected to be minimal. We anticipate that today's rule will result in one airplane retiring sooner than the operator would like, in contrast to the NPRM which predicted that many airplanes would retire sooner. Thus our base case model attributes the cost of this rule to the retirement of that one airplane, because it will reach the anticipated LOV within the 20-year analysis period. This will result in costs of $3.8 million, with a present value of $3.6 million.

Thus, as noted earlier, this final rule's expected present-value benefits of $4.8 million exceed the expected present-value costs of $3.6 million.

FIGURE 5—COMPARISON OF COST ASSUMPTIONS FOR NPRM AND FINAL RULE

NPRM assumptions	NPRM present value costs ($ millions)	Final rule assumptions	Final rule present value costs ($ millions)
Operator Retirement Costs • Initial Operational Limit (IOL) = Design Service Goal (DSG). • 27 airplanes would be retired in the first year of compliance. • Some IOL extensions.	160	Operator Retirement Costs • Limit of validity (LOV) > DSG for many models. • 1 airplane would be retired in the 20-year analysis period. • Few LOV extensions.	3.6
Operator Maintenance Program Costs • WFD maintenance actions [49] were included with extended operational limits. • We assumed some operators would perform maintenance actions.	164	Operator Maintenance Program Costs • With higher LOV, WFD maintenance actions may be necessary and would be mandated by ADs, per existing practice.[50] • Operators' costs to perform maintenance actions are included in cost of ADs.	0
Design Approval Holder (DAH) Costs Assumed 10% of entire costs.	36	DAH Costs Assumed minimal costs because DAHs are voluntarily developing LOVs and maintenance actions.	0
Total Costs	360	Total Costs	3.6

Who is potentially affected by this rulemaking?

- Design approval holders of transport category airplanes with a maximum takeoff gross weight greater than 75,000 pounds.
- Applicants for type certificates of transport category airplanes with a maximum takeoff gross weight greater than 75,000 pounds, if the date of application was before the effective date of the rule.
- Applicants for amendments to type certificates of transport category airplanes with a maximum takeoff gross weight greater than 75,000 pounds, with the exception of those that change the maximum takeoff gross weight of the airplane.
- Applicants or design approval holders for either supplemental type certificates or amendments to type certificates that increase maximum takeoff gross weights from 75,000 pounds or less to greater than 75,000 pounds.
- Applicants or design approval holders for either supplemental type certificates or amendments to type certificates that decrease maximum takeoff gross weight from greater than 75,000 pounds to 75,000 pounds or less after the effective date of the rule.
- Applicants for future type certificates, or for either supplemental type certificates or amendments to future type certificates, for all transport category airplanes, after the effective date of the rule.
- U.S. certificate holders and foreign air carriers and foreign persons operating U.S.-registered transport category airplanes under 14 CFR part 121 or 129 with a maximum takeoff gross weight greater than 75,000 pounds.
- Operators of any transport category airplanes certified in the future, regardless of maximum takeoff gross weight, if the date of application was after the effective date of the rule.

Our Cost Assumptions and Sources of Information

- Discount rate = 7%.
- Period of Analysis = 20 years.
- Value of fatality averted = $5.8 million (Source: U.S. Department of Transportation, *Treatment of Value of Life and Injuries in Preparing Economic Evaluations,* February 8, 2008).
- Aircraft Values = 2009 Avitas Blue Book of Jet Aircraft/Industry Consultation.
- Aircraft Fleet Data = OAG Associates Fleet Database.

Alternatives Considered

The FAA considered four alternatives to the proposed rule. These were:

1. Exclude small entities.
2. Extend the compliance deadline for small entities.

[49] Maintenance actions include inspections, modifications, and replacements. Because the extended LOV is not required, operators would have to decide to retire airplanes or perform the maintenance actions with the extended LOV.

[50] These ADs would be issued eventually, even without this rule, because WFD is inevitable and is an unsafe condition. More ADs may need to be written without this rule. If the necessary service information is not developed until after a finding of WFD in service, the resulting ADs are likely to include interim action requirements and have shorter compliance times, as compared with ADs issued based on service information developed as required by this rule.

3. Establish lesser technical requirements for small entities.

4. Expand the requirements To cover more airplanes.

1. Exclude Small Entities

The FAA concluded that excluding small entities from all the requirements of the proposed rule was not justified. The purpose of the proposed rule is to maintain the airworthy operating condition of airplanes regardless of secondary considerations.

2. Extend the Compliance Deadline for Small Entities

The FAA also considered options that would lengthen the compliance period for small operators. The FAA believes time extensions only provide modest cost savings and leave the system safety at risk.

3. Establish Lesser Technical Requirements for Small Entities

The FAA considered establishing lesser technical requirements for small entities. However, the FAA believes the risks are similarly unreasonable for small entities operating airplanes susceptible to WFD, and that the benefits of including small entities justify the cost.

4. Expand the Requirements To Cover More Airplanes

The FAA considered requiring all operators of existing transport category airplanes to comply with the proposed rule. However, the overwhelming majority of passengers and cargo are carried by airplanes with a maximum gross takeoff weight of greater than 75,000 pounds. The 75,000 pound weight cutoff was based on recommendations from the AAWG for WFD rulemaking. Because of this, the FAA decided to restrict compliance to operators of those airplanes.

The FAA concludes the current rule is the preferred alternative because it has benefits exceeding compliance costs and allows for continued operation of certain airplanes only up to the point where existing maintenance actions can no longer ensure that the airplanes are free from WFD.

Benefits of This Rulemaking

The non-quantified benefits include the safe (from WFD) operation of airplanes up to the LOV.

The lower-bound present value benefits of this final rule (the minimum value of a range estimate of benefits) are $4.8 million in present value. These quantified benefits are based on the near elimination of emergency airworthiness directives.

Costs of This Rulemaking

The total incremental costs of this final rule are approximately $3.6 million in present value from the costs of retiring one airplane.

Final Regulatory Flexibility Analysis

Introduction and Purpose of This Analysis

The Regulatory Flexibility Act of 1980 (Pub. L. 96–354) (RFA) establishes "as a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of the businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure that such proposals are given serious consideration." The RFA covers a wide range of small entities, including small businesses, not-for-profit organizations, and small governmental jurisdictions.

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

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

The FAA considers that this final rule will not result in a significant economic impact on a substantial number of small entities. The purpose of this analysis is to provide the reasoning underlying the FAA determination.

First, we will discuss the reasons why the FAA is considering this action. We will follow with a discussion of the objective of, and legal basis for, the final rule. Next, we explain there are no relevant Federal rules which may overlap, duplicate, or conflict with the final rule. Then we will discuss the substantial changes from the proposed to the final rule. Next, we will discuss the comments received about the Initial Regulatory Flexibility Analysis (IRFA). Lastly, we will describe and provide an estimate of the number of small entities affected by the final rule and why the FAA considers that this final rule will not result in a significant economic impact on a substantial number of small entities.

We now discuss the reasons why the FAA is considering this action.

The FAA is issuing this final rule to address the structural problems of aging airplanes known as "widespread fatigue damage" (WFD). WFD is characterized by the simultaneous presence of cracks at multiple structural locations that are of sufficient size and density that the structure will no longer meet its residual strength requirement and could catastrophically fail.

Past examples of WFD occurring in the fleet include:

- The 1988 Aloha 737 accident,
- An in-flight Lockheed Model L–1011 failure of aft pressure bulkhead stringer attach fittings,
- A McDonnell Douglas Model DC–9 aft pressure bulkhead cracks,
- Boeing Models 727 and 737 lap splice cracking,
- Boeing Model 767 aft pressure bulkhead cracking, and
- Boeing Model 747 and Airbus A300 frame cracking.

Because of these past incidents, accidents, and inspection discoveries and others, the FAA has already issued about 100 WFD-related airworthiness directives.

This final rule is being promulgated because the FAA believes the risk of an accident caused by WFD, and the potential collateral damage after such an accident, is too high without implementing today's rule.

We now discuss the objective of, and legal basis for, the final rule. Next, we discuss if there are relevant Federal rules which may overlap, duplicate, or conflict with the final rule.

Title 49 of the United States Code requires the FAA Administrator to consider the following authority:

- Assigning, maintaining, and enhancing safety and security as the highest priorities in air commerce. (49 U.S.C. 40101(d)(1).
- Aging Airplane Safety Act of 1991. (49 U.S.C. 44717).
- The FAA Administrator's statutory duty to carry out his or her responsibilities "in a way that best tends to reduce or eliminate the possibility or recurrence of accidents in air transportation." (*See* 49 U.S.C. 44701(c)).

Therefore, this final rule will amend Title 14 of the Code of Federal Regulations to require existing design approval holders to establish LOVs and operators of any affected airplane to incorporate those LOVs into maintenance programs of large transport category airplanes with a maximum takeoff gross weight greater than 75,000 pounds, operating under 14 CFR part 121 and 129. These requirements will also apply to all applicants for type certificates after the effective date of the rule and operators of those airplanes. Today's rule does not require that any maintenance actions be performed to prevent WFD before an airplane reaches its LOV. Any maintenance actions necessary to reach the LOV will be mandated by airworthiness directives through separate rulemaking actions, so their costs are not attributable to this final rule.

This final rule will not overlap, duplicate, or conflict with existing Federal Rules.

We now discuss the changes from the proposed to the final rule and the reason the small entity determination in the Final Regulatory Flexibility Analysis (FRFA) has changed.

The FAA has made substantial changes to the WFD NPRM that significantly reduces costs to both small and large business entities. We have eliminated the requirement to evaluate WFD associated with repairs, alterations, and modifications of the baseline airplane structure, except for those mandated by airworthiness directives. This change dramatically reduces the economic impact of the NPRM's estimated compliance costs to small entity operators of part 25 airplanes. Also, in our request for comments, design approval holders responded by providing estimates of LOVs for their affected airplanes. In the NPRM we assumed the LOV will occur at an airplane's design service goal. Based on design approval holder comments LOV, in many cases, occurs anywhere from 33% to 180% beyond the design service goal, depending on the equipment model. An operator can now operate an airplane well past its design service goal and not incur the costs of making the decision to retire or extend the affected airplane's LOV until much later in the airplane's life. The only remaining cost is that we assume operators will retire their airplanes at LOV, rather than incurring the cost of the additional maintenance actions that may be needed for an extended LOV. With the scope of the rule reduced, both in terms of required inspections and in terms of affected airplanes, the economic costs of this final rule are much lower than the costs estimated in the NPRM and in the initial regulatory evaluation.

The FAA will now discuss the one comment received about the Initial Regulatory Flexibility Analysis (IRFA).

In the responses to the IRFA of the NPRM, we received a comment from Lynden Air Cargo. Lynden stated its L–382G airplanes were not included in IRFA. The commenter is correct. The Fleet data services consulted for the initial regulatory evaluation did not carry flight utilization data for L–382Gs, and the FAA was unable to determine the number of accumulated flight cycles or flight hours of Lynden's fleet in comparison to the anticipated LOV for those airplanes. Because of the lack of utilization data, Lynden's fleet was not included in our sample for the IRFA analysis. Lynden Air Cargo has since provided the FAA with utilization information for its L–382G fleet. Lockheed has provided an updated anticipated LOV for the L–382G fleet, based just in hours, and Lynden's entire fleet is below 80% of the LOV. With the base hours less than 80% of LOV, and with the current utilization rates of these airplanes, they will not reach LOV in the 20-year analysis time frame. Therefore the FAA expects no economic impact to Lynden Air Cargo in the analysis period for the final rule.

The FAA will now discuss the methodology used to determine the number of small entities for which the final rule will apply. The FAA will also discuss why the agency considers that this final rule will not result in a significant economic impact on manufacturers of part 25 airplanes.

For aircraft operators and manufacturers, a small entity is defined as one with 1,500 or fewer employees.[51] Since there are operators that met those criteria, the FAA conducted an economic impact assessment to determine if the rule will have a significant economic impact on a substantial number of these operators.

This final rule will become fully effective in 2010. Although the FAA forecasts traffic and air carrier fleets to 2030, too many factors are in play to estimate a future number of small entities, determine if an operator will still be in business, or determine whether that operator will still remain a small business entity. Therefore the agency will use the current U.S. operator's fleet and employment in order to determine the number and impact on small business entities this final rule will affect.

For analysis purposes, the FAA has divided the small entities that might be impacted by this final rule into two major classes, airplane manufacturers and air carriers.

[51] 13 CFR 121.201, Size Standards Used to Define Small Business Concerns, Sector 48–49 Transportation, Subsector 481 Air Transportation.

Currently, U.S. part 25 aircraft manufacturer type certificate holders include the following:

- The Boeing Company.
- Cessna Aircraft Company (a subsidiary of Textron Inc.).
- Raytheon Company.
- Gulfstream Aerospace Corporation (a wholly owned subsidiary of General Dynamics).

All United States part 25 aircraft manufacturers exceed the Small Business Administration small-entity criteria of 1,500 employees for aircraft manufacturers.

Air carriers potentially affected by the final rule include operators engaged in the following:

- Scheduled air transportation.
- Air courier service.
- Nonscheduled air transportation.

The FAA obtained the number of U.S.-operated airplanes having a maximum takeoff gross weight greater than 75,000 pounds from the OAG Associates Fleet Database (March 2009). This database identifies U.S. operators of affected airplanes by providing airplane age and flight utilization statistics. The FAA used the airplane flight utilization information in the analysis of small entity operator's airplanes affected by this WFD final rule. The FAA obtained annual operators' revenue and employment data from current public filings, the World Aviation Directory, and U.S. DOT Form 41 schedules.

Companies with greater than 1,500 employees were excluded from further analysis. Operators in Chapter XI bankruptcy were also excluded, since the outcomes of such proceedings are unknown. Lastly, we excluded all part 25 turbine-powered airplanes with a maximum takeoff gross weight of 75,000 pounds or less, or with a type certificate issued before January 1, 1958, because these airplanes are not affected by the final rule.

This procedure resulted in a list of airplanes, operated by U.S. operators with less than 1,500 employees, with a gross takeoff weight greater than 75,000 pounds. To this database were added airplane-specific design service goals, LOVs, and airplane residual value fields. The FAA used the design service goals published in the WFD NPRM and later updated them based on FAA and industry input. Manufacturers provided the LOVs. Airplane residual values were obtained from the 2009 Avitas Bluebook of Jet Aircraft and consultations with industry.

Next follows the discussion of the number of small entity operators with airplanes affected by the rule, and how much it will cost for them to be in compliance.

Today's rule may cause airplanes to be retired, sold, or replaced sooner than an operator would like. Companies make decisions on the retirement, sale, or replacement of airplanes for many reasons. The decision point to sell, retire, or replace an airplane differs across companies. Operators take into account several key factors in their decision on when to retire an aircraft. The following are some of those key factors:

- Maintenance costs.
- Noise levels.
- Fuel consumption.
- Loss of consumer demand.
- Regulation changes.
- Shifting operator business plans.
- Operating costs.

Therefore, a company generally decides to retire, sell, or replace an airplane long before its LOV is reached. Given current airplane utilization rates, the FAA does not expect the final rule to affect companies below 75% of an airplane's LOV. When an airplane's flight utilization (measured in flight cycles or hours) exceeds 75% of LOV, the expectation is that the WFD provisions will become an increasingly important component of the decision to retire the airplane. All U.S. airplanes over 75% LOV currently operated by small business entities are in non-scheduled service. Many of these affected airplanes are being operated by cargo operators and hence have a lower utilization rate than their counterparts in scheduled passenger service.

The FAA discovered that 21 airplanes being operated by eight small entities were over 75% of LOV. For the 21 affected airplanes over 75% of LOV, the FAA analyzed utilization history reports by serial number. Results of this analysis showed that saying that 21 airplanes are over 75% of their LOVs overstates the number of airplanes affected by this final rule, because some of those airplanes listed as active have not accrued utilization statistics for years. The agency has identified 9 out of the 21 affected airplanes that have not accrued utilization for the past two years or longer. If the airplanes are not accumulating flight cycles or hours for years, then given the age of these airplanes, the FAA assumes that these airplanes are parked or retired.

This final rule will impose either the retirement of an airplane at LOV or a set of maintenance changes to extend the LOV for the airplane. In this final regulatory analysis, the assumption is that operators will retire the airplanes at LOV. The airplane retirement cost is the operator's most expensive economic choice based on compliance with the final rule.

The FAA's analysis determined that no small entities currently operate airplanes over 100% of LOV.

One small entity currently operates one airplane between 90–100% of LOV. Four small entities currently operate four airplanes between 80–90% of LOV. Lastly, the database lists four small entities operating seven airplanes between 75–80% of LOV. Table 1 shows these results:

Table 1

Number of Small Entitites & Their Airplanes Operating Near LOV

	Operators	Total Airplanes
Over LOV	0	0
90-100% LOV	1	1
80-90%LOV	4	4
75-80%LOV	4	7

To estimate when an airplane will exceed LOV, the FAA followed these steps: From the March 2009 OAG Associates Fleet database the FAA calculated the average age of U.S.-operated part 25 transport category retired airplanes over time. OAG defines a retired airplane as one that has been retired, scrapped or otherwise destroyed by its owner/operator at the end of the airplane's useful life. The FAA calculated the average age based upon the retired airplanes in the OAG fleet database beginning in the 1940s. On average, part 25 passenger airplanes were operated for 25 years and cargo airplanes were operated for 34 years, and then retired from U.S. service.

For the base case in the regulatory evaluation, the FAA assumed that in year 25 of operation, every affected passenger airplane will convert to cargo service and then retire from cargo service at 34 years. The FAA chose this scenario for the cost model because it captures nearly all of the affected airplanes.

The FAA applied these average ages to the affected airplanes in Table 1 and retired airplanes over the average retirement age of 34 years over the 20-year analysis interval used in the regulatory evaluation. Under this model, the agency assumes retirement of only one Boeing 747 airplane operated by a small business entity, because that airplane will reach its LOV before reaching its average retirement age.

The model estimates one small business entity will retire one airplane soon after the rule is promulgated. This small business entity will need to implement an appropriate WFD program, and either apply for an extended LOV or retire the airplane. For the FRFA, the FAA assumed the affected small entity will retire the airplane.

The FAA estimated the final rule's present value costs to the air carrier based on the 2009 Avitas Bluebook of Jet Aircraft residual value of the airplane forced to retire. The present-value residual value of the affected airplane is $3.6 million. The ratio of this present value cost to annual revenues is 1.28%. The FAA does not consider this impact to be economically significant, and since only one entity is potentially affected, this is not a substantial number of small entities.

The FAA Administrator certifies that this rule will not have a significant economic impact on a substantial number of small entities.

International Trade Impact Analysis

The Trade Agreements Act of 1979 (Pub. L. 96–39), as amended by the Uruguay Round Agreements Act (Pub. L. 103–465), prohibits Federal agencies from establishing standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. Pursuant to these Acts, the establishment of standards is not considered an unnecessary obstacle to the foreign commerce of the United States, so long as the standard has a legitimate domestic objective, such as the protection of safety, and does not operate in a manner that excludes imports that meet this objective. The statute also requires consideration of international standards and, where appropriate, that they be the basis for United States standards. The FAA has assessed the potential effect of this final rule and determined that it will impose the same costs on domestic and international entities and thus has a neutral trade impact.

Unfunded Mandates Assessment

Title II of the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4) requires each Federal agency to prepare a written statement assessing the effects of any Federal mandate in a proposed or final agency rule that may result in an expenditure of $100 million or more (in 1995 dollars) in any one year by State, local, and Tribal governments, in the aggregate, or by the private sector; such a mandate is deemed to be a "significant regulatory action." The FAA currently uses an inflation-adjusted value of $136.1 million in lieu of $100 million. This final rule does not contain such a mandate. The requirements of Title II do not apply.

Executive Order 13132, Federalism

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

Regulations Affecting Intrastate Aviation in Alaska

Section 1205 of the FAA Reauthorization Act of 1996 (110 Stat. 3213) requires the FAA, when modifying its regulations in a manner affecting intrastate aviation in Alaska, to consider the extent to which Alaska is not served by transportation modes other than aviation, and to establish appropriate regulatory distinctions. In the NPRM, the FAA requested comments on whether the proposed rule should apply differently to intrastate operations in Alaska. As discussed earlier, the FAA received comments on this subject from the late Senator Stevens, Senator Murkowski, and Everts Air Cargo and has determined that there would not be an adverse effect on intrastate air transportation in Alaska and that regulatory distinctions are not appropriate.

Environmental Analysis

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

Regulations That Significantly Affect Energy Supply, Distribution, or Use

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

List of Subjects

14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements, Continued airworthiness.

14 CFR Part 26

Aircraft, Aviation safety, Continued airworthiness.

14 CFR Parts 121 and 129

Air carriers, Aircraft, Aviation safety, Continued airworthiness, Reporting and recordkeeping requirements.

The Amendments

■ In consideration of the foregoing, the Federal Aviation Administration amends Chapter I of Title 14, Code of Federal Regulations, parts 25, 26, 121, and 129, as follows:

PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

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

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

■ 2. Amend § 25.571 by revising paragraphs (a)(3) introductory text and (b) introductory text to read as follows:

§ 25.571 Damage-tolerance and fatigue evaluation of structure.

(a) * * *

(3) Based on the evaluations required by this section, inspections or other procedures must be established, as necessary, to prevent catastrophic failure, and must be included in the Airworthiness Limitations section of the Instructions for Continued Airworthiness required by § 25.1529. The limit of validity of the engineering data that supports the structural maintenance program (hereafter referred to as LOV), stated as a number of total accumulated flight cycles or flight hours or both, established by this section must also be included in the Airworthiness Limitations section of the Instructions for Continued Airworthiness required by § 25.1529. Inspection thresholds for the following types of structure must be established based on crack growth analyses and/or tests, assuming the structure contains an initial flaw of the maximum probable size that could exist as a result of manufacturing or service-induced damage:

* * * * *

(b) *Damage-tolerance evaluation.* The evaluation must include a determination of the probable locations and modes of damage due to fatigue, corrosion, or accidental damage. Repeated load and static analyses supported by test evidence and (if available) service experience must also be incorporated in the evaluation. Special consideration for widespread fatigue damage must be included where the design is such that this type of damage could occur. An LOV must be established that corresponds to the period of time, stated as a number of total accumulated flight cycles or flight hours or both, during which it is demonstrated that widespread fatigue damage will not occur in the airplane structure. This demonstration must be by full-scale fatigue test evidence. The type certificate may be issued prior to completion of full-scale fatigue testing, provided the Administrator has approved a plan for completing the required tests. In that case, the Airworthiness Limitations section of the Instructions for Continued Airworthiness required by § 25.1529 must specify that no airplane may be operated beyond a number of cycles equal to ½ the number of cycles accumulated on the fatigue test article, until such testing is completed. 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:

* * * * *

■ 3. Amend section H25.4 of Appendix H to part 25 by revising paragraph (a)(1) and adding paragraph (a)(4) to read as follows:

Appendix H to Part 25—Instructions for Continued Airworthiness

* * * * *

H25.4 *Airworthiness Limitations section.*

(a) * * *

(1) Each mandatory modification time, replacement time, structural inspection interval, and related structural inspection procedure approved under § 25.571.

* * * * *

(4) A limit of validity of the engineering data that supports the structural maintenance program (LOV), stated as a total number of accumulated flight cycles or flight hours or both, approved under § 25.571. Until the full-scale fatigue testing is completed and the FAA has approved the LOV, the number of cycles accumulated by the airplane cannot be greater than ½ the number of cycles accumulated on the fatigue test article.

* * * * *

PART 26—CONTINUED AIRWORTHINESS AND SAFETY IMPROVEMENTS FOR TRANSPORT CATEGORY AIRPLANES

■ 4. The authority citation for part 26 continues to read as follows:

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

■ 5. Revise § 26.5 to read as follows:

§ 26.5 Applicability table.

Table 1 of this section provides an overview of the applicability of this part. It provides guidance in identifying what sections apply to various types of entities. The specific applicability of each subpart and section is specified in the regulatory text.

TABLE 1—APPLICABILITY OF PART 26 RULES

	Applicable sections			
	Subpart B EAPAS/FTS	Subpart C widespread fatigue damage	Subpart D fuel tank flammability	Subpart E damage tolerance data
Effective date of rule	December 10, 2007	January 14, 2011	December 26, 2008	January 11, 2008
Existing [1] TC Holders	26.11	26.21	26.33	26.43, 26.45, 26.49
Pending [1] TC Applicants	26.11	26.21	26.37	26.43, 26.45
Future [2] TC applicants	N/A	N/A	N/A	26.43
Existing [1] STC Holders	N/A	26.21	26.35	26.47, 26.49
Pending [1] STC/ATC applicants	26.11	26.21	26.35	26.45, 26.47, 26.49
Future [2] STC/ATC applicants	26.11	26.21	26.35	26.45, 26.47, 26.49
Manufacturers	N/A	N/A	26.39	N/A

[1] As of the effective date of the identified rule.
[2] Application made after the effective date of the identified rule.

■ 6. Add subpart C to read as follows:

Subpart C—Aging Airplane Safety—Widespread Fatigue Damage

Subpart C—Aging Airplane Safety—Widespread Fatigue Damage

§ 26.21 Limit of validity.

(a) *Applicability.* Except as provided in paragraph (g) of this section, this section applies to transport category, turbine-powered airplanes with a maximum takeoff gross weight greater than 75,000 pounds and a type certificate issued after January 1, 1958, regardless of whether the maximum takeoff gross weight is a result of an original type certificate or a later design change. This section also applies to transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958, if a design change approval for which application is made after January 14, 2011 has the effect of reducing the maximum takeoff gross weight from greater than 75,000 pounds to 75,000 pounds or less.

(b) *Limit of validity.* Each person identified in paragraph (c) of this section must comply with the following requirements:

(1) Establish a limit of validity of the engineering data that supports the structural maintenance program (hereafter referred to as LOV) that corresponds to the period of time, stated as a number of total accumulated flight cycles or flight hours or both, during which it is demonstrated that widespread fatigue damage will not occur in the airplane. This demonstration must include an evaluation of airplane structural configurations and be supported by test evidence and analysis at a minimum and, if available, service experience, or service experience and teardown inspection results, of high-time airplanes of similar structural design, accounting for differences in operating conditions and procedures. The airplane structural configurations to be evaluated include—

(i) All model variations and derivatives approved under the type certificate; and

(ii) All structural modifications to and replacements for the airplane structural configurations specified in paragraph (b)(1)(i) of this section, mandated by airworthiness directives as of January 14, 2011.

(2) If the LOV depends on performance of maintenance actions for which service information has not been mandated by airworthiness directive as of January 14, 2011, submit the following to the FAA Oversight Office:

(i) For those maintenance actions for which service information has been issued as of the applicable compliance date specified in paragraph (c) of this section, a list identifying each of those actions.

(ii) For those maintenance actions for which service information has not been issued as of the applicable compliance date specified in paragraph (c) of this section, a list identifying each of those actions and a binding schedule for providing in a timely manner the necessary service information for those actions. Once the FAA Oversight Office approves this schedule, each person identified in paragraph (c) of this section must comply with that schedule.

(3) Unless previously accomplished, establish an Airworthiness Limitations section (ALS) for each airplane structural configuration evaluated under paragraph (b)(1) of this section.

(4) Incorporate the applicable LOV established under paragraph (b)(1) of this section into the ALS for each airplane structural configuration evaluated under paragraph (b)(1) and submit it to the FAA Oversight Office for approval.

(c) *Persons who must comply and compliance dates.* The following persons must comply with the requirements of paragraph (b) of this section by the specified date.

(1) Holders of type certificates (TC) of airplane models identified in Table 1 of this section: No later than the applicable date identified in Table 1 of this section.

(2) Applicants for TCs, if the date of application was before January 14, 2011: No later than the latest of the following dates:

(i) January 14, 2016;

(ii) The date the certificate is issued; or

(iii) The date specified in the plan approved under § 25.571(b) for completion of the full-scale fatigue testing and demonstrating that widespread fatigue damage will not occur in the airplane structure.

(3) Applicants for amendments to TCs, with the exception of amendments to TCs specified in paragraphs (c)(6) or (c)(7) of this section, if the original TC was issued before January 14, 2011: No later than the latest of the following dates:

(i) January 14, 2016;

(ii) The date the amended certificate is issued; or

(iii) The date specified in the plan approved under § 25.571(b) for completion of the full-scale fatigue testing and demonstrating that widespread fatigue damage will not occur in the airplane structure.

(4) Applicants for amendments to TCs, with the exception of amendments to TCs specified in paragraphs (c)(6) or (c)(7) of this section, if the application for the original TC was made before January 14, 2011 but the TC was not issued before January 14, 2011: No later than the latest of the following dates:

(i) January 14, 2016;

(ii) The date the amended certificate is issued; or

(iii) The date specified in the plan approved under § 25.571(b) for completion of the full-scale fatigue testing and demonstrating that widespread fatigue damage will not occur in the airplane structure.

(5) Holders of either supplemental type certificates (STCs) or amendments to TCs that increase maximum takeoff gross weights from 75,000 pounds or less to greater than 75,000 pounds: No later than July 14, 2012.

(6) Applicants for either STCs or amendments to TCs that increase maximum takeoff gross weights from 75,000 pounds or less to greater than 75,000 pounds: No later than the latest of the following dates:

(i) July 14, 2012;

(ii) The date the certificate is issued; or

(iii) The date specified in the plan approved under § 25.571(b) for completion of the full-scale fatigue testing and demonstrating that widespread fatigue damage will not occur in the airplane structure.

(7) Applicants for either STCs or amendments to TCs that decrease maximum takeoff gross weights from greater than 75,000 pounds to 75,000 pounds or less, if the date of application was after January 14, 2011: No later than the latest of the following dates:

(i) July 14, 2012;

(ii) The date the certificate is issued; or

(iii) The date specified in the plan approved under § 25.571(b) for completion of the full-scale fatigue testing and demonstrating that widespread fatigue damage will not occur in the airplane structure.

(d) *Compliance plan.* Each person identified in paragraph (e) of this section must submit a compliance plan consisting of the following:

(1) A proposed project schedule, identifying all major milestones, for meeting the compliance dates specified in paragraph (c) of this section.

(2) A proposed means of compliance with paragraphs (b)(1) through (b)(4) of this section.

(3) A proposal for submitting a draft of all compliance items required by paragraph (b) of this section for review by the FAA Oversight Office not less than 60 days before the compliance date specified in paragraph (c) of this section, as applicable.

(4) A proposal for how the LOV will be distributed.

(e) *Compliance dates for compliance plans.* The following persons must submit the compliance plan described in paragraph (d) of this section to the FAA Oversight Office by the specified date.

(1) Holders of type certificates: No later than April 14, 2011.

(2) Applicants for TCs and amendments to TCs, with the exception of amendments to TCs specified in paragraphs (e)(4), (e)(5), or (e)(6) of this section, if the date of application was before January 14, 2011 but the TC or TC amendment was not issued before January 14, 2011: No later than April 14, 2011.

(3) Holders of either supplemental type certificates or amendments to TCs that increase maximum takeoff gross weights from 75,000 pounds or less to greater than 75,000 pounds: No later than April 14, 2011.

(4) Applicants for either STCs or amendments to TCs that increase maximum takeoff gross weights from 75,000 pounds or less to greater than 75,000 pounds, if the date of application was before January 14, 2011: No later than April 14, 2011.

(5) Applicants for either STCs or amendments to TCs that increase maximum takeoff gross weights from 75,000 pounds or less to greater than 75,000 pounds, if the date of application is on or after January 14, 2011: Within 90 days after the date of application.

(6) Applicants for either STCs or amendments to TCs that decrease maximum takeoff gross weights from greater than 75,000 pounds to 75,000 pounds or less, if the date of application is on or after January 14, 2011: Within 90 days after the date of application.

(f) *Compliance plan implementation.* Each affected person must implement the compliance plan as approved in compliance with paragraph (d) of this section.

(g) *Exceptions.* This section does not apply to the following airplane models:

(1) Bombardier BD–700.

(2) Bombardier CL–44.

(3) Gulfstream GV.

(4) Gulfstream GV–SP.

(5) British Aerospace, Aircraft Group, and Societe Nationale Industrielle Aerospatiale Concorde Type 1.

(6) British Aerospace (Commercial Aircraft) Ltd., Armstrong Whitworth Argosy A.W. 650 Series 101.

(7) British Aerospace Airbus, Ltd., BAC 1–11.

(8) BAE Systems (Operations) Ltd., BAe 146.

(9) BAE Systems (Operations) Ltd., Avro 146.

(10) Lockheed 300–50A01 (USAF C141A).

(11) Boeing 707.

(12) Boeing 720.

(13) deHavilland D.H. 106 Comet 4C.

(14) Ilyushin Aviation IL–96T.

(15) Bristol Aircraft Britannia 305.

(16) Avions Marcel Dassault-Breguet Aviation Mercure 100C.

(17) Airbus Caravelle.

(18) D & R Nevada, LLC, Convair Model 22.

(19) D & R Nevada, LLC, Convair Model 23M.

TABLE 1—COMPLIANCE DATES FOR AFFECTED AIRPLANES

Airplane model (all existing [1] models)	Compliance date—(months after January 14, 2011)
Airbus:	
A300 Series, A310 Series, A300–600 Series	18
A318 Series	48
A319 Series	48
A320 Series	48
A321 Series	48
A330–200, –200 Freighter, –300 Series	48
A340–200, –300, –500, –600 Series	48
A380–800 Series	60
Boeing:	
717	48
727 (all series)	18
737 (Classics): 737–100, –200, –200C, –300, –400, –500	18
737 (NG): 737–600, –700, –700C, –800, –900, –900ER	48
747 (Classics): 747–100, –100B, –100B SUD, –200B, -200C, –200F, –300, 747SP, 747SR	18
747–400: 747–400, –400D, –400F	48
757	48
767	48
777–200, –300	48
777–200LR, 777–300ER, 777F	60
Bombardier:	
CL–600: 2D15 (Regional Jet Series 705), 2D24 (Regional Jet Series 900)	60
Embraer:	
ERJ 170	60
ERJ 190	60
Fokker:	
F.28 Mark 0070, Mark 0100	18
Lockheed:	
L–1011	18
188	18
382 (all series)	18
McDonnell Douglas:	
DC–8, –8F	18
DC–9	18
MD–80 (DC–9–81, –82, –83, –87, MD–88)	18
MD–90	48
DC–10	18
MD–10	48
MD–11, –11F	48
All Other Airplane Models Listed on a Type Certificate as of January 14, 2011	60

[1] Type certificated as of January 14, 2011.

§ 26.23 Extended limit of validity.

(a) *Applicability.* Any person may apply to extend a limit of validity of the engineering data that supports the structural maintenance program (hereafter referred to as LOV) approved under § 25.571 of this subchapter, § 26.21, or this section. Extending an LOV is a major design change. The applicant must comply with the relevant provisions of subparts D or E of part 21 of this subchapter and paragraph (b) of this section.

(b) *Extended limit of validity.* Each person applying for an extended LOV must comply with the following requirements:

(1) Establish an extended LOV that corresponds to the period of time, stated as a number of total accumulated flight cycles or flight hours or both, during which it is demonstrated that widespread fatigue damage will not occur in the airplane. This demonstration must include an evaluation of airplane structural configurations and be supported by test evidence and analysis at a minimum and, if available, service experience, or service experience and teardown inspection results, of high-time airplanes of similar structural design, accounting for differences in operating conditions and procedures. The airplane structural configurations to be evaluated include—

(i) All model variations and derivatives approved under the type certificate for which approval for an extension is sought; and

(ii) All structural modifications to and replacements for the airplane structural configurations specified in paragraph (b)(1)(i) of this section, mandated by airworthiness directive, up to the date of approval of the extended LOV.

(2) Establish a revision or supplement, as applicable, to the Airworthiness Limitations section (ALS) of the Instructions for Continued Airworthiness required by § 25.1529 of this subchapter, and submit it to the FAA Oversight Office for approval. The revised ALS or supplement to the ALS must include the applicable extended LOV established under paragraph (b)(1) of this section.

(3) Develop the maintenance actions determined by the WFD evaluation performed in paragraph (b)(1) of this section to be necessary to preclude WFD from occurring before the airplane reaches the proposed extended LOV. These maintenance actions must be documented as airworthiness limitation items in the ALS and submitted to the FAA Oversight Office for approval.

PART 121—OPERATING REQUIREMENTS: DOMESTIC, FLAG, AND SUPPLEMENTAL OPERATIONS

■ 7. The authority citation for part 121 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 40119, 41706, 44101, 44701–44702, 44705, 44709–44711, 44713, 44716–44717, 44722, 44901, 44903–44904, 44912, 45101–45105, 46105, 46301.

■ 8. Add new § 121.1115 to read as follows:

§ 121.1115 Limit of validity.

(a) *Applicability.* This section applies to certificate holders operating any transport category, turbine-powered airplane with a maximum takeoff gross weight greater than 75,000 pounds and a type certificate issued after January 1, 1958, regardless of whether the maximum takeoff gross weight is a result of an original type certificate or a later design change. This section also applies to certificate holders operating any transport category, turbine-powered airplane with a type certificate issued after January 1, 1958, regardless of the maximum takeoff gross weight, for which a limit of validity of the engineering data that supports the structural maintenance program (hereafter referred to as LOV) is required in accordance with § 25.571 or § 26.21 of this chapter after January 14, 2011.

(b) *Limit of validity.* No certificate holder may operate an airplane identified in paragraph (a) of this section after the applicable date identified in Table 1 of this section unless an Airworthiness Limitations section approved under Appendix H to part 25 or § 26.21 of this chapter is incorporated into its maintenance program. The ALS must—

(1) Include an LOV approved under § 25.571 or § 26.21 of this chapter, as applicable, except as provided in paragraph (f) of this section; and

(2) Be clearly distinguishable within its maintenance program.

(c) *Operation of airplanes excluded from § 26.21.* No certificate holder may operate an airplane identified in § 26.21(g) of this chapter after July 14, 2013, unless an Airworthiness Limitations section approved under Appendix H to part 25 or § 26.21 of this chapter is incorporated into its maintenance program. The ALS must—

(1) Include an LOV approved under § 25.571 or § 26.21 of this chapter, as applicable, except as provided in paragraph (f) of this section; and

(2) Be clearly distinguishable within its maintenance program.

(d) *Extended limit of validity.* No certificate holder may operate an airplane beyond the LOV, or extended LOV, specified in paragraph (b)(1), (c), (d), or (f) of this section, as applicable, unless the following conditions are met:

(1) An ALS must be incorporated into its maintenance program that—

(i) Includes an extended LOV and any widespread fatigue damage airworthiness limitation items approved under § 26.23 of this chapter; and

(ii) Is approved under § 26.23 of this chapter.

(2) The extended LOV and the airworthiness limitation items pertaining to widespread fatigue damage must be clearly distinguishable within its maintenance program.

(e) *Principal Maintenance Inspector approval.* Certificate holders must submit the maintenance program revisions required by paragraphs (b), (c), and (d) of this section to the Principal Maintenance Inspector for review and approval.

(f) *Exception.* For any airplane for which an LOV has not been approved as of the applicable compliance date specified in paragraph (c) or Table 1 of this section, instead of including an approved LOV in the ALS, an operator must include the applicable default LOV specified in Table 1 or Table 2 of this section, as applicable, in the ALS.

TABLE 1—AIRPLANES SUBJECT TO § 26.21

Airplane model	Compliance date—months after January 14, 2011	Default LOV [flight cycles (FC) or flight hours (FH)]
Airbus—Existing[1] Models Only:		
A300 B2–1A, B2–1C, B2K–3C, B2–203	30	48,000 FC
A300 B4–2C, B4–103	30	40,000 FC
A300 B4–203	30	34,00 FC
A300–600 Series	30	30,000 FC/67,500 FH
A310–200 Series	30	40,000 FC/60,000 FH
A310–300 Series	30	35,000 FC/60,000 FH
A318 Series	60	48,000 FC/60,000 FH
A319 Series	60	48,000 FC/60,000 FH
A320–100 Series	60	48,000 FC/48,000 FH
A320–200 Series	60	48,000 FC/60,000 FH
A321 Series	60	48,000 FC/60,000 FH
A330–200, –300 Series (except WV050 family) (non enhanced)	60	40,000 FC/60,000 FH
A330–200, –300 Series WV050 family (enhanced)	60	33,000 FC/100,000 FH
A330–200 Freighter Series	60	*See* NOTE.
A340–200, –300 Series (except WV 027 and WV050 family) (non enhanced)	60	20,000 FC/80,000 FH
A340–200, –300 Series WV 027 (non enhanced)	60	30,000 FC/60,000 FH
A340–300 Series WV050 family (enhanced)	60	20,000 FC/100,000 FH
A340–500, –600 Series	60	16,600 FC/100,000 FH
A380–800 Series	72	*See* NOTE.
Boeing—Existing[1] Models Only:		
717	60	60,000 FC/60,000 FH
727 (all series)	30	60,000 FC
737 (Classics): 737–100, –200, –200C, –300, –400, –500	30	75,000 FC
737 (NG): 737–600, –700, –700C, –800, –900, –900ER	60	75,000 FC
747 (Classics): 747–100, –100B, –100B SUD, –200B, –200C, –200F, –300, 747SP, 747SR.	30	20,000 FC
747–400: 747–400, –400D, –400F	60	20,000 FC
757	60	50,000 FC
767	60	50,000 FC
777–200, –300	60	40,000 FC

TABLE 1—AIRPLANES SUBJECT TO § 26.21—Continued

Airplane model	Compliance date—months after January 14, 2011	Default LOV [flight cycles (FC) or flight hours (FH)]
777–200LR, 777–300ER	72	40,000 FC
777F	72	11,000 FC
Bombardier—Existing[1] Models Only:		
CL–600: 2D15 (Regional Jet Series 705), 2D24 (Regional Jet Series 900)	72	60,000 FC
Embraer—Existing[1] Models Only:		
ERJ 170	72	*See* NOTE.
ERJ 190	72	*See* NOTE.
Fokker—Existing[1] Models Only:		
F.28 Mark 0070, Mark 0100	30	90,000 FC
Lockheed—Existing[1] Models Only:		
L–1011	30	36,000 FC
188	30	26,600 FC
382 (all series)	30	20,000 FC/50,000 FH
McDonnell Douglas—Existing[1] Models Only:		
DC–8, –8F	30	50,000 FC/50,000 FH
DC–9 (except for MD–80 models)	30	100,000 FC/100,000 FH
MD–80 (DC–9–81, –82, –83, –87, MD–88)	30	50,000 FC/50,000 FH
MD–90	60	60,000 FC/90,000 FH
DC–10–10, –15	30	42,000 FC/60,000 FH
DC–10–30, –40, –10F, –30F, –40F	30	30,000 FC/60,000 FH
MD–10–10F	60	42,000 FC/60,000 FH
MD–10–30F	60	30,000 FC/60,000 FH
MD–11, MD–11F	60	20,000 FC/60,000 FH
Maximum Takeoff Gross Weight Changes:		
All airplanes whose maximum takeoff gross weight has been decreased to 75,000 pounds or below after January 14, 2011 or increased to greater than 75,000 pounds at any time by an amended type certificate or supplemental type certificate.	30, or within 12 months after the LOV is approved, or before operating the airplane, whichever occurs latest.	Not applicable.
All Other Airplane Models (TCs and amended TCs) not Listed in Table 2	72, or within 12 months after the LOV is approved, or before operating the airplane, whichever occurs latest.	Not applicable.

[1] Type certificated as of January 14, 2011.

Note: Airplane operation limitation is stated in the Airworthiness Limitation section.

TABLE 2—AIRPLANES EXCLUDED FROM § 26.21

Airplane model	Default LOV [flight cycles (FC) or flight hours (FH)]
Airbus:	
Caravelle	15,000 FC/24,000 FH
Avions Marcel Dassault:	
Breguet Aviation Mercure 100C	20,000 FC/16,000 FH
Boeing:	
Boeing 707 (-100 Series and -200 Series)	20,000 FC
Boeing 707 (-300 Series and -400 Series)	20,000 FC
Boeing 720	30,000 FC
Bombardier:	
CL–44D4 and CL–44J	20,000 FC
BD–700	15,000 FH
Bristol Aeroplane Company:	
Britannia 305	10,000 FC
British Aerospace Airbus, Ltd.:	
BAC 1–11 (all models)	85,000 FC
British Aerospace (Commercial Aircraft) Ltd.:	
Armstrong Whitworth Argosy A.W. 650 Series 101	20,000 FC
BAE Systems (Operations) Ltd.:	
BAe 146–100A (all models)	50,000 FC
BAe 146–200–07	50,000 FC
BAe 146–200–07 Dev	50,000 FC
BAe 146–200–11	50,000 FC
BAe 146–200–07A	47,000 FC
BAe 146–200–11 Dev	43,000 FC

TABLE 2—AIRPLANES EXCLUDED FROM § 26.21—Continued

Airplane model	Default LOV [flight cycles (FC) or flight hours (FH)]
BAe 146–300 (all models)	40,000 FC
Avro 146–RJ70A (all models)	40,000 FC
Avro 146–RJ85A and 146–RJ100A (all models)	50,000 FC
D & R Nevada, LLC:	
Convair Model 22	1,000 FC/1,000 FH
Convair Model 23M	1,000 FC/1,000 FH
deHavilland Aircraft Company, Ltd.:	
D.H. 106 Comet 4C	8,000 FH
Gulfstream:	
GV	40,000 FH
GV–SP	40,000 FH
Ilyushin Aviation Complex:	
IL–96T	10,000 FC/30,000 FH
Lockheed:	
300–50A01 (USAF C 141A)	20,000 FC

PART 129—OPERATIONS: FOREIGN AIR CARRIERS AND FOREIGN OPERATORS OF U.S.-REGISTERED AIRCRAFT ENGAGED IN COMMON CARRIAGE

■ 9. The authority citation for part 129 continues to read:

Authority: 49 U.S.C. 1372, 40113, 40119, 44101, 44701–44702, 44705, 44709–44711, 44713, 44716–44717, 44722, 44901–44904, 44906, 44912, 46105, Pub. L. 107–71 sec. 104.

■ 10. Add new § 129.115 to read as follows:

§ 129.115 Limit of validity.

(a) *Applicability.* This section applies to foreign air carriers or foreign persons operating any U.S.-registered transport category, turbine-powered airplane with a maximum takeoff gross weight greater than 75,000 pounds and a type certificate issued after January 1, 1958, regardless of whether the maximum takeoff gross weight is a result of an original type certificate or a later design change. This section also applies to foreign air carriers or foreign persons operating any other U.S.-registered transport category, turbine-powered airplane with a type certificate issued after January 1, 1958, regardless of the maximum takeoff gross weight, for which a limit of validity of the engineering data that supports the structural maintenance program (hereafter referred to as LOV) is required in accordance with § 25.571 or § 26.21 of this chapter after January 14, 2011.

(b) *Limit of validity.* No foreign air carrier or foreign person may operate a U.S.-registered airplane identified in paragraph (a) of this section after the applicable date identified in Table 1 of this section, unless an Airworthiness Limitations section (ALS) approved under Appendix H to part 25 or § 26.21 of this chapter is incorporated into its maintenance program. The ALS must—

(1) Include an LOV approved under § 25.571 or § 26.21 of this chapter, as applicable, except as provided in paragraph (f) of this section; and

(2) Be clearly distinguishable within its maintenance program.

(c) *Operation of airplanes excluded from § 26.21.* No certificate holder may operate an airplane identified in § 26.21(g) of this chapter after July 14, 2013, unless an ALS approved under Appendix H to part 25 or § 26.21 of this chapter is incorporated into its maintenance program. The ALS must—

(1) Include an LOV approved under § 25.571 or § 26.21 of this chapter, as applicable, except as provided in paragraph (f) of this section; and

(2) Be clearly distinguishable within its maintenance program

(d) *Extended limit of validity.* No foreign air carrier or foreign person may operate an airplane beyond the LOV or extended LOV specified in paragraph (b)(1), (c), (d), or (f) of this section, as applicable, unless the following conditions are met:

(1) An ALS must be incorporated into its maintenance program that—

(i) Includes an extended LOV and any widespread fatigue damage airworthiness limitation items (ALIs) approved under § 26.23 of this chapter; and

(ii) Is approved under § 26.23 of this chapter;

(2) The extended LOV and the airworthiness limitation items pertaining to widespread fatigue damage must be clearly distinguishable within its maintenance program.

(e) *Principal Maintenance Inspector approval.* Foreign air carriers or foreign persons must submit the maintenance program revisions required by paragraphs (b), (c), and (d) of this section to the Principal Maintenance Inspector or Flight Standards International Field Office for review and approval.

(f) *Exception.* For any airplane for which an LOV has not been approved as of the applicable compliance date specified in paragraph (c) or Table 1 of this section, instead of including an approved LOV in the ALS, an operator must include the applicable default LOV specified in Table 1 or Table 2 of this section, as applicable, in the ALS.

TABLE 1—AIRPLANES SUBJECT TO § 26.21

Airplane model	Compliance date—months after January 14, 2011	Default LOV [flight cycles (FC) or flight hours (FH)]
Airbus—Existing[1] Models Only:		
A300 B2–1A, B2–1C, B2K–3C, B2–203	30	48,000 FC
A300 B4–2C, B4–103	30	40,000 FC
A300 B4–203	30	34,000 FC
A300–600 Series	30	30,000 FC/67,500 FH

TABLE 1—AIRPLANES SUBJECT TO § 26.21—Continued

Airplane model	Compliance date—months after January 14, 2011	Default LOV [flight cycles (FC) or flight hours (FH)]
A310–200 Series	30	40,000 FC/60,000 FH
A310–300 Series	30	35,000 FC/60,000 FH
A318 Series	60	48,000 FC/60,000 FH
A319 Series	60	48,000 FC/60,000 FH
A320–100 Series	60	48,000 FC/48,000 FH
A320–200 Series	60	48,000 FC/60,000 FH
A321 Series	60	48,000 FC/60,000 FH
A330–200, –300 Series (except WV050 family) (non enhanced)	60	40,000 FC/60,000 FH
A330–200, –300 Series WV050 family (enhanced)	60	33,000 FC/100,000 FH
A330–200 Freighter Series	60	*See* NOTE.
A340–200, –300 Series (except WV 027 and WV050 family) (non enhanced)	60	20,000 FC/80,000 FH
A340–200, –300 Series WV 027 (non enhanced)	60	30,000 FC/60,000 FH
A340–300 Series WV050 family (enhanced)	60	20,000 FC/100,000 FH
A340–500, –600 Series	60	16,600 FC/100,000 FH
A380–800 Series	72	*See* NOTE.
Boeing—Existing [1] Models Only:		
717	60	60,000 FC/60,000 FH
727 (all series)	30	60,000 FC
737 (Classics): 737–100, –200, –200C, –300, –400, –500	30	75,000 FC
737 (NG): 737–600, –700, –700C, –800, –900, –900ER	60	75,000 FC
747 (Classics): 747–100, –100B, –100B SUD, –200B, –200C, –200F, –300, 747SP, 747SR.	30	20,000 FC
747–400: 747–400, –400D, –400F	60	20,000 FC
757	60	50,000 FC
767	60	50,000 FC
777–200, –300	60	40,000 FC
777–200LR, 777–300ER	72	40,000 FC
777F	72	11,000 FC
Bombardier—Existing [1] Models Only:		
CL–600: 2D15 (Regional Jet Series 705), 2D24 (Regional Jet Series 900)	72	60,000 FC
Embraer—Existing [1] Models Only:		
ERJ 170	72	*See* NOTE.
ERJ 190	72	*See* NOTE.
Fokker—Existing [1] Models Only:		
F.28 Mark 0070, Mark 0100	30	90,000 FC
Lockheed—Existing [1] Models Only:		
L–1011	30	36,000 FC
188	30	26,600 FC
382 (all series)	30	20,000 FC/50,000 FH
McDonnell Douglas—Existing [1] Models Only:		
DC–8, –8F	30	50,000 FC/50,000 FH
DC–9 (except for MD–80 series)	30	100,000 FC/100,000 FH
MD–80 (DC–9–81, –82, –83, –87, MD–88)	30	50,000 FC/50,000 FH
MD–90	60	60,000 FC/90,000 FH
DC–10–10, –15	30	42,000 FC/60,000 FH
DC–10–30, –40, –10F, –30F, –40F	30	30,000 FC/60,000 FH
MD–10–10F	60	42,000 FC/60,000 FH
MD–10–30F	60	30,000 FC/60,000 FH
MD–11, MD–11F	60	20,000 FC/60,000 FH
Maximum Takeoff Gross Weight Changes	30, or within 12 months after the LOV is approved, or before operating the airplane, whichever occurs latest.	Not applicable.
All airplanes whose maximum takeoff gross weight has been decreased to 75,000 pounds or below after January 14, 2011 or increased to greater than 75,000 pounds at any time by an amended type certificate or supplemental type certificate.		
All Other Airplane Models (TCs and amended TCs) not Listed in Table 2	72, or within 12 months after the LOV is approved, or before operating the airplane, whichever occurs latest.	Not applicable.

[1] Type certificated as of January 14, 2011.

Note: Airplane operation limitation is stated in the Airworthiness Limitation section.

TABLE 2—AIRPLANES EXCLUDED FROM § 26.21

Airplane model	Default LOV [flight cycles (FC) or flight hours (FH)]
Airbus:	
Caravelle	15,000 FC/24,000 FH
Avions Marcel Dassault:	
Breguet Aviation Mercure 100C	20,000 FC/16,000 FH
Boeing:	
Boeing 707 (–100 Series and –200 Series)	20,000 FC
Boeing 707 (–300 Series and –400 Series)	20,000 FC
Boeing 720	30,000 FC
Bombardier:	
CL–44D4 and CL–44J	20,000 FC
BD–700	15,000 FH
Bristol Aeroplane Company:	
Britannia 305	10,000 FC
British Aerospace Airbus, Ltd.:	
BAC 1–11 (all models)	85,000 FC
British Aerospace (Commercial Aircraft) Ltd.:	
Armstrong Whitworth Argosy A.W. 650 Series 101	20,000 FC
BAE Systems (Operations) Ltd.:	
BAe 146–100A (all models)	50,000 FC
BAe 146–200–07	50,000 FC
BAe 146–200–07 Dev	50,000 FC
BAe 146–200–11	50,000 FC
BAe 146–200–07A	47,000 FC
BAe 146–200–11 Dev	43,000 FC
BAe 146–300 (all models)	40,000 FC
Avro 146–RJ70A (all models)	40,000 FC
Avro 146–RJ85A and 146–RJ100A (all models)	50,000 FC
D & R Nevada, LLC:	
Convair Model 22	1,000 FC/1,000 FH
Convair Model 23M	1,000 FC/1,000 FH
deHavilland Aircraft Company, Ltd.:	
D.H. 106 Comet 4C	8,000 FH
Gulfstream:	
GV	40,000 FH
GV–SP	40,000 FH
Ilyushin Aviation Complex:	
IL–96T	10,000 FC/30,000 FH
Lockheed:	
300–50A01 (USAF C 141A)	20,000 FC

Issued in Washington, DC, on October 28, 2010.

J. Randolph Babbitt,

Administrator.

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