#8

Date Filed: April 29, 2004.
Parties: Members of the International Air Transport Association.
Subject: Mail Vote 369—Resolution 010p, TC31 North and Central Pacific, Special Passenger Amending Resolution from Korea (Rep. of) to USA r1, Intended effective date: 15 May 2004.
Docket Number: OST–2004–17670.
Date Filed: April 29, 2004.
Parties: Members of the International Air Transport Association.
Subject: Mail Vote 372 Resolution 010t, TC31 North and Central Pacific, Special Passenger Amending Resolution from Philippines to Canada, USA r-1, Intended effective date: 15 May 2004.

Andrea M. Jenkins,
Program Manager, Docket Operations, Federal Register Liaison.
[FR Doc. 04–10811 Filed 5–12–04; 8:45 am]
BILLING CODE 4910–62–P

DEPARTMENT OF TRANSPORTATION

Office of the Secretary

Drug Testing Procedures

AGENCY: Office of the Secretary (OST), U.S. Department of Transportation (DOT).

ACTION: Informational Notice: HHS Drug Testing Proposals.

SUMMARY: The Department of Transportation (DOT) is issuing this notice to call to the attention of employers, employees, testing service agents, and other interested persons in its transportation industry drug testing program a notice proposing important new Department of Health and Human Services (HHS) drug testing procedures. Because of the close relationship between HHS and DOT drug testing procedures, participants in the DOT transportation industry drug testing program should be aware of important issues that HHS is considering, which may later affect the DOT testing program.

Comment Closing Date: HHS is considering comments on its proposal through July 12, 2004.

ADDRESSES: Comments on the HHS proposal should be sent directly to HHS. The following are HHS" instructions to commenters on how and where to submit comments:

You may submit comments, identified by Docket Number 04–7984, by any of the following methods:

- *E-mail: wvogl@samhsa.gov.* Include docket number and/or RIN number in the subject line of the message.
- *Fax:* (301) 443–3031.
- *Mail:* 5600 Fishers Lane, Rockwall II, Suite 815, Rockville, Maryland 20857.
- *Hand Delivery/Courier:* 5515 Security Lane, Suite 815, Rockville, Maryland 20852.
- *Information Collection Requirements:* Submit comments to the Office of Information and Regulatory Affairs, OMB, New Executive Office Building, 725 17th Street, NW., Washington, DC 20502, Attn: Desk Officer for SAMHSA. Because of delays in receipt of mail, comments may also be sent to (202) 95–6974 (fax).
- *Instructions:* All submissions received must include the agency name and docket number or Regulatory Information Number (RIN) for this rulemaking. All comments will be available for public review at 5515 Security Lane, Suite 815, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: The HHS informational contact on this rulemaking is Walter F. Vogl, Ph.D., Drug Testing Section, Division of Workplace Programs, CSAP, 5600 Fishers Lane, Rockwall II, Suite 815, Rockville, Maryland 20857, (301) 443–6014 (voice), (301) 443–3031 (fax), *wvogl@samhsa.gov* (e-mail). The DOT contacts on drug testing procedure issues are Jim Swart, Acting Director, Office of Drug and Alcohol Policy Compliance, 400 7th Street, SW., Washington DC 20590, phone (202) 366–3784; e-mail *jim.swart@ost.dot.gov;* and Robert C. Ashby, Deputy Assistant General Counsel for Regulation and Enforcement, same address, phone (202) 366–9310; e-mail *bob.ashby@ost.dot.gov.*

SUPPLEMENTARY INFORMATION: The Department of Health and Human Services (HHS) has issued an important notice proposing to revise its Mandatory Guidelines for Federal Workplace Drug Testing programs [69 FR 19673; April 13, 2004]. Interested persons may access the HHS document on the Internet at the following URL: *http://a257.g.akamaitech.net/7/257/2422/14mar20010800/edocket.access.gpo.gov/2004/pdf/04-7984.pdf.* In their summary of the document HHS states, "The Department of Health and Human Services is proposing to establish scientific and technical guidelines for the testing of hair, sweat, and oral fluid specimens in addition to urine specimens; scientific and technical guidelines for using on-site tests to test urine and oral fluid at the collection site; requirements for the certification of instrumented initial test facilities; and added standards for collectors, on-site testers, and medical review officers."

This HHS proposal does not propose to amend the drug testing requirements and procedures that apply to the Department of Transportation drug testing program for DOT-regulated industries (49 CFR Part 40). Nevertheless, we believe that employers, employees, and testing service providers involved in the DOT testing program should be aware of the HHS notice. We recommend that DOT program participants review the HHS proposals and, if they have views or concerns to express, comment on the notice *to HHS.* The reason for this suggestion is that there is a close relationship between the HHS Mandatory Guidelines and the DOT testing procedures in 49 CFR Part 40.

Part 40, first issued in 1988, incorporated the substance of original HHS Guidelines, adapting the HHS provisions to the transportation workplace. In 1991, Congress enacted the Omnibus Transportation Employee Testing Act. This statute recognized the existing close relationship between the HHS guidelines and Part 40. The statute requires DOT to "incorporate" the HHS guidelines and amendments to them into DOT testing procedures, while leaving DOT sufficient authority to tailor its own program. Because of this statutorily recognized relationship between these guidelines and Part 40, any HHS final rule resulting from its current proposal, while not directly regulating transportation industry employers, will necessarily have to be considered by the Department of Transportation in the context of potential future revisions to Part 40.

We urge interested persons to read the HHS document carefully and to provide any comments directly to the HHS Docket.

Issued this 5th day of May, 2004, at Washington DC.

Jim L. Swart,
Acting Director, Office of Drug and Alcohol Policy and Compliance.
[FR Doc. 04–10810 Filed 5–12–04; 8:45 am]
BILLING CODE 4910–62–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

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

AGENCY: Federal Aviation Administration (FAA), DOT.

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

SUMMARY: The FAA assigned the Aviation Rulemaking Advisory Committee a new task to develop guidance that will support industry compliance with the Aging Airplane Safety Rule requirements that relate to supplemental structural inspections. This new tasking will also address certain aspects of recommendations made during a previous ARAC tasking related to widespread fatigue damage. This notice is to inform the public of this ARAC activity.

FOR FURTHER INFORMATION CONTACT: Mike Kaszycki, Federal Aviation Administration, Transport Standards Staff, 1601 Lind Avenue, SW., Renton, Washington 98055–4056, *mike.kaszycki@faa.gov*.

SUPPLEMENTARY INFORMATION:

Background

The FAA established the Aviation Rulemaking Advisory Committee to provide advice and recommendations to the FAA Administrator on the FAA's rulemaking activities with respect to aviation-related issues. This includes obtaining advice and recommendations on the FAA's commitments to harmonize Title 14 of the Code of Federal Regulations (14 CFR) with its partners in Europe and Canada.

Airplane Applicability of Tasking

This new tasking shall apply to transport category airplanes with a type-certificated passenger seating capacity of 30 or greater, or a maximum payload capacity of 7,500 pounds or greater, operated under part 121 or under part 129 (U.S. registered airplanes).

Statement of Tasking

There are four major tasks to be completed under this tasking:

Task 1.—Repairs to Baseline Primary Structure and Repairs to Alterations and Modifications

Draft an Advisory Circular (AC) that contains guidance to support the following two paths of compliance with §§ 121.370a and 129.16 of the Aging Airplane Safety Interim Final Rule (AASIFR):

1. *Damage-tolerance-based inspection program developed by part 121 and 129 certificate holders:* Develop guidelines and procedures that will enable part 121 and 129 certificate holders to develop a damage-tolerance-based inspection program that addresses repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

2. *Model specific damage-tolerance-based inspection program:* Develop Guidance that can be used by Type Certificate (TC) holders, Supplemental Type Certificate (STC) holders, and Structural Task Groups to support the development of a model specific damage-tolerance-based inspection program. The model specific damage-tolerance-based inspection program will address repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The developed model specific inspection program will support part 121 and 129 certificate holders' compliance with the AASIFR.

A written report will also be submitted that includes an action plan for the implementation of the recommendations of task 1 that will be addressed in task 4 below. The report is to be submitted to the Aviation Rulemaking Advisory Committee (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.

In the process of drafting the AC, the ARAC should assess the effectiveness of AC 91–56B to provide guidance to TC and STC holders for developing damage-tolerance-based inspections and procedures for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The ARAC should do the following:

- Assess the effectiveness of AC 91–56B to support Industry compliance with the AASIFR with respect to repairs.
- Document any improvements to the AC that would provide better direction with respect to the guidance for TC and STC holders in their development of damage-tolerance-based inspections and procedures for repairs.

The ARAC is requested to validate that the guidance material in the new AC will result in programs that provide a high degree of autonomy for part 121 and 129 certificate holders while supporting compliance with the AASIFR. In order to determine a rational approach for addressing repairs to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, and are not currently covered by a mandated program, the AC should provide guidance to the part 121 and 129 certificate holders and to the type certificate holder to address the seven issues listed below.

1. The significance of the airplane certification amendment level in providing direction for the development of damage tolerance inspections and methods for repairs.

2. The degree to which Supplemental Structural Inspection Documents/Programs (SSID/P) or equivalent documents/programs provide direction to repair the structure using damage-tolerance-rated repairs. The assessment should apply to SSID/Ps or equivalent documents/programs developed for 14 CFR part 25 pre-amendment 25–45 transport airplane models having a maximum gross takeoff weight of 75,000 lbs or greater. The following should be identified:

- Areas of aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by SSID/Ps or equivalent documents/programs
- Significant assumptions applied in developing SSID/Ps or equivalent documents/programs
- Any significant issues in the implementation of the requirements of SSID/Ps or equivalent documents/programs
- Data from SSID/Ps or equivalent documents/programs that would be useful in supporting this new tasking

3. The degree to which an applicable airplane model's Airworthiness Limitations Section (ALS) provides direction to repair the structure using damage-tolerance-rated repairs. This assessment should apply to damage-tolerance-based inspection programs/data developed for 14 CFR part 25 amendment 25–45 or later transport airplane models having a maximum gross takeoff weight of 75,000 lbs or greater. The following should be identified:

- Areas of aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by a damage-tolerance-based inspection program/data
- Any significant issues in the implementation of the requirements of the damage-tolerance-based inspection programs/data
- Data from the damage-tolerance-based inspection programs that would be useful in supporting this new tasking

4. The degree to which existing Repair Assessment Guideline documents developed for §§ 121.370 and 129.32 provide damage-tolerance-based inspections for repairs made to aircraft structure that is susceptible to fatigue

cracking that could contribute to a catastrophic failure. The assessment should identify the following:

- Areas of the aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by these documents
- Data from these documents that would be useful in supporting this new tasking

5. Identify the issues/difficulties industry has encountered with establishing damage-tolerance-based inspections and procedures for repairs as required by various FAA approaches in issuing SSIP airworthiness directives (*e.g.*, 727/737 AD 98–11–03 R1, AD 98–11–04 R1 verses other SSIP AD approaches like the 747). The assessment should identify the following:

- Comparison of approaches with pros and cons for each approach
- Data from these documents that would be useful in supporting this new tasking

6. Assess the extent to which Structural Repair Manuals (SRM) provide damage-tolerance-based inspections for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

7. Assess the need to include damage-tolerance-based inspections and procedures in TC and STC Holder issued Service Bulletins (SB) that provide repair instructions for aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

Task 2.—Alterations and Modifications to Baseline Primary Structure, Including STCs and Amended Type Certificates (ATCs)

Prepare a written report assessing how an operator would include damage-tolerance-based inspections and procedures for alterations and modifications made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. This assessment would include, but is not limited to, alterations and modifications performed under an STC, ATC, FAA field approval (*e.g.*, FAA form 337) and/or FAA approved TC holder design data. The report should include a recommendation on the best means to develop damage-tolerance-based inspections and procedures for these alterations and modifications and the applicability of AC 91–56B. The ARAC should assess the effectiveness of AC 91–56B to provide guidance to STC holders for developing damage-tolerance-based inspections and procedures for alterations and modifications. The ARAC should do the following:

- Assess the effectiveness of AC 91–56B to support Industry compliance with the AASIFR with respect to alterations and modifications.
- Document any improvements to the AC that would provide better direction with respect to the guidance for STC holders in their development of damage-tolerance-based inspections and procedures for alterations and modifications.

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 should also provide a recommendation on the means of compliance provided by the AC developed in Task 1 in regards to repairs installed on STC or ATC approved alterations and modifications. 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 (FAA concurrence is necessary to ensure actions will support industry compliance with the AASIFR).

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.

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 the 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.

Schedule

The tasking will be performed in two phases. In Phase 1, the ARAC will provide to the FAA the results of Tasks 1 through 3. Phase 1 should be accomplished by December 16, 2005.

In Phase 2, the Structures Task Groups, under the direction of the ARAC, should produce the model specific guidance material, Task 4, using the guidelines and procedures of the AC produced in Phase 1. The ARAC will be responsible for coordinating and overseeing the STG's application of the AC. Phase 2 documents should be completed by December 18, 2009.

ARAC Acceptance of Task

ARAC accepted the task and assigned the task to the Airworthiness Assurance Working Group, Transport Airplane and Engine Issues. The Structural Task Groups (STG) composed of type certificate and part 121 and 129 certificate holders familiar with the specific model aircraft will support the working group. The working group will serve as staff to ARAC and assist in the analysis of the assigned task. ARAC must review and approve the working group's recommendations. If ARAC accepts the working group's recommendations, it will forward them to the FAA.

Working Group Activity

The Airworthiness Assurance Working Group must comply with the procedures adopted by ARAC. As part of the procedures, the working group must:

1. Recommend a work plan for completion of the task, including the rationale supporting such a plan for consideration at the next meeting of the ARAC on transport airplane and engine issues held following publication of this notice.

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

3. Draft the appropriate documents and required analyses and/or any other related materials or documents.

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

Participation in the Working Group

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

If you have expertise in the subject matter and wish to become a member of the working group you should write to the person listed under the caption **FOR FURTHER INFORMATION CONTACT** expressing that desire, describing your interest in the task, and stating the expertise you would bring to the working group. We must receive your request to participate no later than May 28, 2004. The assistant chair, the assistant executive director, and the working group chair will review your request and will advise you whether your request is approved.

If you are chosen for membership on the working group, you must represent your aviation community segment and actively participate in the working group (*e.g.*, attend all meetings, provide written comments when requested to do so, *etc.*). You must also devote the resources necessary to support the working group in meeting any assigned deadlines. You must keep your management chain and those you may represent advised of working group activities and decisions to ensure that the proposed technical solutions don't conflict with your sponsoring organization's position when the subject being negotiated is presented to ARAC for approval.

Once the working group has begun deliberations, members will be added or substituted only with the approval of the assistant chair, the assistant executive director, and the working group chair.

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

Meetings of the ARAC will be open to the public. Meetings of the 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. The FAA will make no public announcement of working group meetings.

Issued in Washington, DC, on May 4, 2004.

Anthony F. Fazio,

Executive Director, Aviation Rulemaking Advisory Committee.

[FR Doc. 04–10816 Filed 5–12–04; 8:45 am]

BILLING CODE 4910–13–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Transition to Docket Management System

AGENCY: Federal Aviation Administration, DOT.

ACTION: Notice of policy change.

SUMMARY: This notice announces a transition that will make docket files for future airworthiness directives (AD) available on the Internet. The docket files will be available in the DOT's Docket Management System (DMS).

FOR FURTHER INFORMATION CONTACT: Linda S. Walker, Program Manager, Federal Aviation Administration, Aircraft Certification Service, Aircraft Engineering Division, Delegations and Airworthiness Programs Branch, AIR–140, Room, 813, 800 Independence Avenue, SW., Washington, DC 20591; telephone (202) 267–9592; fax (202) 267–5340; e-mail: *linda.s.walker@faa.gov.*

Background

In mid-May, the FAA will make change that will make docket files for future AD actions easier for you to access. With the exception of some AD actions already in process, we will be placing the docket files for many of our AD actions into the DMS on the Internet at *http://dms.dot.gov/.* You can continue to view AD docket files for previously issued ADs in the office of the issuing Directorate or in the Office of the Assistant Chief Counsel for the issuing Directorate.

The DMS is an electronic, image-based database in which DOT stores the docketed material for DOT rulemaking activities for you to view. This online database contains more than 1.2 million pages of regulatory and adjudicatory information for easy research and retrieval. Anyone with Internet access can submit comments on rulemaking activities electronically to the DMS and view comments already submitted.

The AD docket files contain justification documents that support an AD action. Once we begin placing AD dockets on the DMS, all material routinely part of the AD docket file will be available electronically with the exception of any materials that for any reason cannot be scanned. Materials that cannot be scanned will be maintained in the office of the issuing Directorate or in the Office of the Assistant Chief Counsel for the issuing Directorate.

This policy will apply to future docket files. You can continue to view the docket files of, and submit comments on, previous AD actions that are not maintained in the DMS, at the addresses indicated in the AD actions. We will not transfer existing paper dockets to the DMS. If you do not have Internet access, each AD action published in the **Federal Register** will contain the physical address of the DMS for viewing any AD docket information, and for submitting any comments on that action.

We will continue to publish AD actions in the **Federal Register**.

Issued in Washington, DC, on May 5, 2004.

Susan J.M. Cabler,

Assistant Manager, Aircraft Engineering Division, Aircraft Certification Service.

[FR Doc. 04–10817 Filed 5–12–04; 8:45 am]

BILLING CODE 4910–13–M

DEPARTMENT OF TRANSPORTATION

Federal Highway Administration

Environmental Impact Statement: Providence, RI

AGENCY: Federal Highway Administration (FHWA), DOT.

ACTION: Notice of intent.

SUMMARY: The FHWA is issuing this notice to advise the public that an environmental impact statement will be prepared for a proposed transportation project in the city of Providence, Rhode Island.

FOR FURTHER INFORMATION CONTACT: Lucy Garliauskas, Division Administrator, Federal Highway Administration, 380 Westminster Mall, Room 547, Providence, Rhode Island 02903, Telephone: (401) 528–4541, OR Kazem Farhoumand, P.E., Deputy Chief Engineer, Rhode Island Department of Transportation, 2 Capitol Hill, Room 236, Providence, Rhode Island 02903,

U.S. Department
of Transportation

**Federal Aviation
Administration**

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

OCT 10 2006

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

Dear Mr. Bolt:

This letter is in reply to your July 25, 2006, letter transmitting the draft advisory circular and recommendations for guidance on developing damage tolerance data for repairs, alterations, and repairs to alterations. We appreciate the consensus position reached within the Airworthiness Assurance Working Group (AAWG) and the Aviation Rulemaking Advisory Committee (ARAC). Our hope is that industry and the public will also support this effort.

I wish to thank the ARAC, specifically members of Transport Airplane and Engine Issues and its working group who provided resources and expertise to develop the report. The report will be placed on the ARAC website at:
http://www.faa.gov/regulations_policies/rulemaking/committees/arac/.

We consider your submittal of the final report as completion of Phase 1, Task 2 of our May 13, 2004, tasking statement. We will keep the committee apprised of the agency's efforts on this recommendation through the FAA report at future ARAC meetings.

Sincerely,

Nicholas A. Sabatini
Associate Administrator for Aviation Safety

U.S. Department
of Transportation

**Federal Aviation
Administration**

800 Independence Ave. S.W.
Washington, D.C. 2059·

MAR 1 3 2006

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

Dear Mr. Bolt:

This is in reply to your letter to Mr. Nicholas Sabatini, dated February 7, 2006, transmitting a recommendation from the Airworthiness Assurance Working Group (AAWG). I understand members of the AAWG reached full consensus on the recommendation.

I wish to thank the Aviation Rulemaking Advisory Committee (ARAC), the members associated with Transport Airplane and Engine (TAE) Issues, and the TAE working groups that provided resources to develop the recommendation.

We consider your submittal of the recommendation as partial completion of Phase 1 of the ARAC tasking. We understand the AAWG will complete Phase 1 and Phase 2 of the tasking as a follow-on activity. We have forwarded the AAWG recommendation to the Transport Airplane Directorate for action. The recommendation will be placed on the ARAC website at: http://www.faa.gov/regulations_policies/rulemaking/committees/arac/.

We shall keep the committee apprised of the agency's efforts on this recommendation through the FAA report at future TAE meetings.

Sincerely,

Anthony F. Fazio
Director, Office of Rulemaking

Pratt & Whitney
400 Main Street
East Hartford, CT 06108

Pratt & Whitney
A United Technologies Company

February 7, 2006

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

Attention: Mr. Nicholas Sabatini, Associate Administrator for Aviation Safety

Subject: ARAC Tasking, Airworthiness Assurance Working Group, Federal Register, May 13, 2004

Dear Nick,

The Transport Airplane and Engines Issues Group is pleased to forward the attached report from the Airworthiness Assurance Working Group as an ARAC recommendation. The Tasking requested the AAWG to consider how best to comply with the requirements set forth in 14 CFR 121.370a and 129.16, the Aging Airplane Safety Final Rule.

This final report is being submitted as a full consensus position of the AAWG.

The Task assigned from ARAC was split into two Phases and four subtasks. Subtasks 1, 2 and 3 are addressed in Phase 1 and Subtask 4 is addressed in Phase 2. The final report covers the activities specifically requested for Phase 1. Phase 2, Subtask 4 is also addressed but only as a proposed follow-on activity. In addition Subtasks 2 and 3 requested recommendations on how to best handle the specific issues of developing damage tolerance based inspections for alterations and a means to assess and provide maintenance actions for repairs alterations and modification that might be susceptible to the development of widespread fatigue damage. In concert with the ARAC request, recommendations on Subtask 2 and 3 are included in the report. These recommendations are included in Appendix E of the final report.

Phase 1, Subtask 1 requested that the AAWG develop an Advisory Circular for persons seeking compliance to 14 CFR 121.370a and 129.16 for repairs and repairs to alterations and modifications. This AC is included in the Final Report as Appendix B. Note that the report is intended to address part 121 aircraft with 30 or more passengers.

In the course of executing the task, Draft AC 91-56B was reviewed. The AAWG determined that this draft AC did not provide the necessary guidance to Certificate Holders seeking compliance to 14 CFR 121.370a and 129.16. The AAWG has proposed a new Draft AC 91-56x for FAA consideration. This Draft AC is included in the Final Report as Appendix C.

TAEIG would like to thank the AAWG for their effort on this difficult and complex task. There are many aspects to how repairs have been handled in the past and based on this review by the AAWG, there were several other conclusions and recommendations for further ARAC action. These are listed in the Executive Summary and Section 6 of the report.

Sincerely yours,

Craig R. Bolt

C. R. Bolt
Assistant Chair, TAEIG

Copy: Dionne Palermo – FAA-NWR
Mike Kaszycki – FAA-NWR
John Linsenmeyer – FAA- Washington DC, ARM-207
TAEIG Distribution List

A REPORT OF THE AIRWORTHINESS ASSURANCE WORKING GROUP

RECOMMENDATIONS CONCERNING ARAC TASKING FR Doc. 04-10816

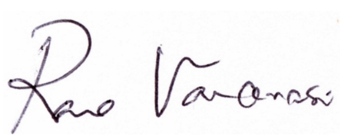
RE: AGING AIRPLANE SAFETY FINAL RULE

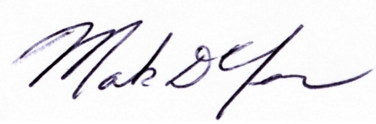
14 CFR 121.370a AND 129.16

FINAL REPORT

October 28, 2005

SIGNED BY





Rao Varanasi

Co-Chairperson, AAWG

Boeing Commercial Airplanes

Mark Yerger

Co-Chairperson, AAWG

Federal Express

REVISION PAGE

LTR	DATE	CHANGE	PAGES ADDED	PAGES DELETED	PAGES CHANGED	APPROVED BY

Table of Contents

Deleted: Deleted:

List of Figures

Deleted:

Deleted:

Deleted:

List of Tables

.

Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:

List of Abbreviations

The following abbreviations are used throughout this report

AASA	Aging Airplane Safety Act of 1991
AASFR	Aging Airplane Safety Final Rule
AASIFR	Aging Airplane Safety Interim Final Rule
AATF	Airworthiness Assurance Task Force
AAWG	Airworthiness Assurance Working Group
AC	Advisory Circular (FAR)
ACO	Aircraft Certification Office
AD	Airworthiness Directive
AIA	Aerospace Industries Association of America
ALS	Airworthiness Limitation Section
ARAC	Aviation Rulemaking Advisory Committee
ATA	Air Transport Association of America
ATC	Amended Type Certificate
CAA	Civil Aviation Authority
CAR	Civil Airworthiness Requirements
CFR	Code of Federal Regulations
DAH	Design Approval Holder
DSG	Design Service Goal
DT data	Damage Tolerance Data
DTE	Damage Tolerance Evaluation
DTIP	Damage Tolerance Inspection and Procedures
EASA	European Aviation Safety Agency
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
ISP	Inspection Start Point
LOV	Limit of Validity
MPD	Maintenance Planning Document
NDI	Non Destructive Inspection
NPRM	Notice of Proposed Rulemaking
OEM	Original Equipment Manufacturer
PMI	Principal Maintenance Inspector (FAA)
RAG	Repair Assessment Guidelines
RAM	Repairs, Alterations and Modifications
RAP	Repair Assessment Program
SB	Service Bulletin
SMP	Structural Modification Point
SRM	Structural Repair Manual
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

List of References

The following is provided as a means to access current rules and regulations together with previous ARAC Recommendations from the AAWG. Documents noted by an (*) are available at the following web site.

http://www.faa.gov

1. Title 14 of the Code of Federal Regulations (14 CFR): The following Regulations are referenced in this report:

a. Part 21, §21.101*
b. Part 25, §§ 25.571*, 25.1529*
c. Part 43, §§ 43.13*, 43.16*
d. Part 91, § 91.403*
e. Part 121, §§ 121.368*, 121.370*, 121.370a*
f. Part 129, §§ 129.16*, 129.32*, 129.33*

2. Advisory Circulars (AC): The following Advisory Circulars are reference in this report:

a. AC 21.101-1, Change Product Rule*
b. AC 25.571-1, Damage Tolerance and Fatigue Evaluation of Structure*
c. AC 25.571-1A, Damage Tolerance and Fatigue Evaluation of Structure*
d. AC 25.571-1B, Damage Tolerance and Fatigue Evaluation of Structure*
e. AC 25.571-1C, Damage Tolerance and Fatigue Evaluation of Structure*
f. AC 25.1529-1, Instructions for Continued Airworthiness of Structural Repairs on Transport Airplanes*
g. AC 91-56A, The Continued Airworthiness of Older Airplanes*
h. AC 91-56B, The Continued Airworthiness of Older Airplanes*
i. AC 120-73, Damage Tolerance Assessment of Repairs to Pressurized Fuselages*

3. Other Documents referred to in this report:

a. A Final Report of the AAWG – Continued Airworthiness of Structural Repairs*
b. A Report of the AAWG – Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Airplane Fleet*
c. A Report of the AAWG - Recommendations For Regulatory Action To Enhance Continued Airworthiness Of Supplemental Type Certificates*
d. Repair Assessment Guidelines, FAA Approved Model Specific Guideline Documents**
e. FAA Approved Model Specific Supplemental Inspection Documents**
f. ATA Report 51-93-01 - Structural Maintenance Program Guidelines For Continuing Airworthiness***
g. ATA Response to FAA Docket 1999-5401 Dated May 5, 2003***
h. Federal Register/Vol. 69, No. 146/Friday, July 30, 2004/Rules and Regulations Fuel Tank Safety Compliance Extension (Final Rule) and Aging Airplane Program Update (Request for Comments). Page 45936*
i. A Report to the AAWG - Structures Task Group Guidelines Document, June 1996*
j. Federal Register/ Vol. 67, No. 235 / Friday, December 6, 2002 / Rules and Regulations Aging Airplane Safety

** Various manufacturers publish these documents. Please contact those manufacturers to determine the general availability of the documents.

*** Please contact the ATA.

Executive Summary

On May 13, 2004, the FAA published a new ARAC tasking and assigned it to the Transport Airplane and Engine Issue Group/Airworthiness Assurance Working Group. The Tasking requested Industry assistance in preparing guidance material for certificate holders wishing to show compliance to the Aging Airplane Safety Final Rule, 14 CFR 121.370a and 129.16. The Tasking consisted of four sub-tasks to be accomplished in two phases. In Phase 1, tasks 1, 2, and 3 are completed; in Phase 2, task 4 is completed.

In the process of completing the Task, several recommendations and conclusions were reached. In addition an Advisory Circular was developed in concert with the requirements of the Tasking. In the process of developing the tasking issues, the AAWG reached a total of 22 Conclusions and Recommendations.

Even though 14 CFR 121.370a and 129.16 could be construed to be applicable to repairs alterations and modifications to composite structure, the AAWG did not specifically develop guidelines for this particular type of structure. There were three principal reasons for this: (1) there is not a significant amount of composite primary structure on airplanes today; (2) most of that structure is on airplanes that were certified to Amendment 45 or later; and (3) the certification process in regards to damage tolerance for composite structure is significantly different than that of metallic structure and are adequately covered by AC 20-107A.

Compliance with the new Aging Airplane Safety Final Rule, 14 CFR 121.370a and 129.16 will require operators and DAHs to cooperatively develop data that, in some cases, does not currently exist. The AAWG recommends that this be accomplished through model specific STGs for both baseline structure as well as for repairs, alterations and modifications. Operators of applicable airplanes must have this data to show compliance by December 20, 2010. To this end, all updates to existing data should be published by December 18, 2009.

<u>Task 1 & 2 Conclusions and Recommendations (Repairs and Alterations/Modifications)</u>

The AAWG developed draft AC 120-AAWG to document the process for assessing repairs to fatigue critical structure. The proposed AC addresses repairs to both baseline structure as well as repairs to alteration and modifications. The AAWG believes that the proposed AC 120-AAWG contains sufficient guidance for DAHs to develop a Compliance Document which would support operator compliance with the AASFR for repairs.

Key to initiating this process is the identification of fatigue critical structure for each applicable airplane model. Repairs to the fatigue critical structure will need to be assessed for damage tolerance. Depending on the certification level of the aircraft

model and whether installed repairs are already covered by DT data, this may require a survey of the aircraft.
The conclusions and recommendations (***Bold Italicized***) from the AAWG tasking regarding repairs and repairs to alterations are documented in Sections 3 through 5 of this report. These are summarized below.

1. SSID programs and ALS were developed to address the un-repaired fatigue critical structure and do not consistently provide instructions for repairs to that structure.

2. The AAWG recommends that existing SBs, SRM, SSID programs and ALS programs for each applicable airplane be reviewed and updated to include DT data for all repairs to fatigue critical baseline structure as well as repairs to alterations and modifications by December 18, 2009.

3. The AAWG concluded that there are repairs and modifications to structural components susceptible to fatigue contained in the AMM and/or CMM and that these repairs and modifications are not under the same level of scrutiny that other repairs are subjected to.

4. The AAWG recommends that the FAA issue additional tasking to the ARAC to investigate the status of the AMM and CMM, and make appropriate recommendations.

5. The AAWG concluded that the development of RAG documents for the fuselage pressure boundary (fuselage skin, door skins, and bulkhead webs) provides vital information for operators to comply with 14 CFR 121.370 and 129.32 for the applicable airplanes.

6. The AAWG recommends that a generalized RAP program (includes greater coverage of fatigue critical structure than the pressurized boundaries) be considered and developed, if technically and economically feasible.

7. For those airplanes certified to Amendment 45 or later, where repairs to the fuselage pressure boundary were not provided with DT data, it is recommended that a Fuselage RAP program be developed in accordance with the guidance provided in AC 120-73, if economically feasible.

8. The AAWG recommends that the TAEIG task the AAWG to revise AC 120-AAWG to include a process for developing damage tolerance based maintenance inspections for alterations and modifications. A copy of the proposed tasking is included in Appendix E of this report.

9. The AAWG reviewed draft AC91-56B and made the determination that the guidance material does not provide adequate directions for an entity seeking compliance to AASFR.

10. The AAWG recommends that AC 91-56B be revised as delineated in Sections 2 and 3 of this report. A full draft of a proposed revision of AC 91-56B is included in Appendix C.

11. The AAWG reviewed AC 25.1529-1 and determined that the guidance material would not support compliance to the AASFR and further did not follow industry-accepted practice.

12. The AAWG recommends that AC 25.1529-1 be cancelled and incorporated in pertinent part into the proposed AC 120-AAWG.

13. The AAWG Recommends that AC 120-AAWG be promulgated as a means of compliance to 14 CFR 121.370a and 129.16 with respect to repairs. A copy of this AC is contained in Appendix B.

<u>Task 3 Conclusions and Recommendations (WFD for RAMs)</u>

14. For WFD evaluation, the AAWG concluded that the following two situations should be addressed:

a. The structural configuration of the RAM itself, if it is susceptible to WFD;

b. The effect of the RAM on baseline structure susceptible to WFD.

15. WFD actions for baseline structure should be defined prior to requiring an assessment of the effect of the RAM.

16. The determination of any maintenance actions required to preclude WFD should be done in context with the procedure defined in AC 120-AAWG for determination of the damage tolerance requirements for the RAM:

a. For those airplanes that need a survey to address DT for repairs, the WFD assessment should occur within the same timeframe (action and implementation plan;

b. For newer airplanes that will require WFD analysis for repairs and alterations, (e.g. 14 CFR Part 25 Amdt. 54 and beyond), the WFD action should occur when the airplane reaches DSG

c. For newer airplanes that only require WFD for alterations (e.g. 14 CFR Part 25 Amdt. 96 and beyond) the WFD action should occur at certification

17. Existing DAH documents, like the SRM and RAP, should be updated, in a timely fashion, to include consideration for WFD damage scenarios to support compliance to 121.WFD, where operation past DSG is defined.

18. To complete Task 3, the AAWG recommends that the TAEIG task the AAWG to assemble a group of technical experts for the development of the required technical basis on how to address WFD for RAMs. The work product of this activity would be material for inclusion in either FAA Advisory Circular 120-AAWG or yet another, to be determined, AC. A copy of the proposed Tasking is included in Appendix E of this report.

<u>Task 4 Conclusions and Recommendations (Model Specific Programs)</u>

19. The AAWG concurs with the ARAC Tasking in that it should oversee the timely development and implementation of model specific Compliance Documents and new and updated model specific data to support operator compliance.

20. The AAWG concurs that model specific STGs should be formed to identify the fatigue critical structure, and review existing data that could be used in support of compliance with the AASFR and that the AAWG oversee that activity.

21. The AAWG concluded that the cooperation of the Type Certificate Holders and the Design Approval Holders is necessary for operators to be able to comply with the AASFR.

22. The AAWG recommends that the DAH Model Specific Compliance Document, as delineated in AC 120-AAWG, be published by December 20, 2008, and the new and updated model specific data to support operator compliance be published by December 18, 2009. In addition, the AAWG recommends that the AAWG oversee the development of this data as delineated in Appendix E.

1. Introduction

A. New Tasking

On May 13, 2004, the FAA published a new ARAC tasking and assigned it to the Transport Airplane and Engine Issue Group/Airworthiness Assurance Working Group. The Tasking requested Industry assistance in preparing guidance material for certificate holders wishing to show compliance to the Aging Airplane Safety Final Rule, 14 CFR 121.370a and 129.16. The Tasking consisted of four sub-tasks to be accomplished in two phases. In Phase 1, Tasks 1, 2, and 3 are completed; in Phase 2, Task 4 is completed. The complete tasking statement is contained in Appendix A and summarized below.

1) Phase 1 – Preparation of Guidance Material

Phase 1 of the task requirements require the definition of guidance material and recommendations on the following subjects.

a) Task 1 – Repairs to Fatigue Critical Structure and Repairs to Alterations and Modifications

In Section 2 of this report, the AAWG has developed the rationale for the guidance material that will enable the operators to develop damage tolerance maintenance programs for repairs to fatigue critical structure and repairs to alterations and modifications. The actual proposed Advisory Circular is contained in Appendix B of this report. The FAA requested several subtask be evaluated in the development of the advisory material. These evaluations were conducted and the appropriate information included.

b) Task 2 – Alterations and Modifications

In Section 3 of this report the AAWG provides recommendations to the FAA on appropriate means to develop damage tolerance based maintenance programs for alterations and modifications. These recommendations are in the form of a request for an additional tasking to develop an amended Advisory Circular to include a process to develop the required programs

c) Task 3 – Consideration of Widespread Fatigue Damage for RAMs

In Section 4 of this report, the AAWG provides recommendations to the FAA on appropriate means to include the consideration of WFD prevention for installed repairs, alterations and modifications. These recommendations are in the form of a request for an additional tasking to develop an amended Advisory Circular to include a process to develop the required programs

2) Phase 2 – Task 4 Preparation of Compliance Data

Section 5 of this report briefly describes the expected process the industry will use to develop and implement the required programs.

B. 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:

ABx Air*
Airbus *
Airline Pilot's Association
American Airlines*
Air Transport Association
American West Airlines
Boeing Commercial Airplanes*
British Airways*
Continental Airlines*
Delta Air Lines Incorporated*
Evergreen International Airlines
Federal Aviation Administration*
Federal Express*
Fokker Service
International Air Transport
Japan Air Lines*
EASA*
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. A list of meeting venues and meeting attendance is documented in Appendix F respectively.

2. Task 1 - Development of Guidance Material for Repairs to Fatigue Critical Structure

A. Introduction

A significant change in the airworthiness standards for fatigue occurred in October 1978 with amendment 25-45 wherein §§ 25.571 and 25.573 of 14 CFR Part 25 were revised and deleted respectively. This change involved removing the fail-safe option in its entirety and establishing a new requirement to develop damage tolerance based inspections wherever practical. The fatigue strength approach was retained as a default option to be used only if the damage tolerance approach was shown to be impractical.

The same events and reasoning that drove the changes to airworthiness standards for new airplane also influenced the strategy adopted to ensure the continued airworthiness of the existing fleet. There was increasing concern with respect to existing older airplanes that had been certified in accordance with the fail-safe requirements of CAR 4b.270. Eleven large transport models were specifically identified as needing the most attention and it was decided that damage tolerance based inspection programs should be developed and implemented for these airplanes. These inspections were meant to supplement existing maintenance inspections and thus these programs were referred to as Supplemental Structural Inspection Programs (SSIPs) and the inspection requirements were documented in Supplemental Inspection Documents (SIDs). It was further agreed that the SIDs would be developed by the Original Equipment Manufacturers on a voluntary basis and then mandated by Airworthiness Directive (AD). Guidance for developing the SSIPs was published by the CAA in Airworthiness Notice No. 89, Continuing Structural Integrity of Transport Aeroplanes dated August 23, 1978 and by the FAA in Advisory Circular No. 91-56, Supplemental Structural Inspection Program for Large Transport Category Airplanes dated May 6, 1981. Subsequently SSIPs were developed and mandated by AD for the eleven aging models.

The damage tolerance concept has been adopted from the late 70s for the design, certification, and continued airworthiness of the new and existing aircraft models. However, these requirements have generally only been applied to the baseline structure. No system was in place requesting that repairs to Principal Structural Elements on these aircraft be evaluated to damage tolerance principles. The majority of these repairs were designed to an equal or better static strength requirement.

In response to accidents attributed in part to the aging of the airplane involved, the FAA sponsored in June 1988 a conference on aging airplane and as a result a task force was established representing the interests of the airplane operators, airplane manufacturers, regulatory authorities and other aviation representatives. In addition to other recommendations this task force specifically recommended that the damage tolerance of repairs should be considered. The following actions have been launched:

- The FAA published AC 25.1529-1 in 1991 to provide instructions to ensure continued airworthiness of structural repairs. This AC addresses the approval procedures to follow when making structural repairs to structure certificated under the damage tolerance requirements (including type designs with SIDs which were based on these criteria).

- In direct response to the task force recommendations changes were made to parts 91, 121, 125 and 129 of Title 14 of the CFR in April 2000 to require operators to incorporate damage tolerance based inspections for existing and future repairs to the fuselage pressure boundary for the eleven aging models previously identified. Other models and repairs to other structure were not addressed by the change.

- Model specific ADs have been issued on some of the eleven aging models that address repairs through the existing SSIDs.

Since the introduction of damage tolerance requirements in 1978, and its industry implementation over the years, the compliance status of structural repairs is rather complex to summarize:

- Damage tolerance based inspections have been incorporated for existing and future repairs to the fuselage pressure boundary of the eleven aging models. Existing and new repairs outside pressure boundary may not have been evaluated for damage tolerance.

- New repairs applied to structure certificated under the damage tolerance requirements should have been assessed for damage tolerance, and inspections incorporated as necessary to ensure their continued airworthiness.

1) Fatigue Critical Structure

14 CFR 121.370a/129.16 of the Aging Airplane Safety Final Rule (AASFR) requires operators to incorporate into their maintenance program damage tolerance based inspections and procedures for structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. This category of structure is referred herein as “fatigue critical structure”. The fatigue critical structure includes structure associated with alterations and modifications that are susceptible to fatigue cracking that could contribute to a catastrophic failure. It should be noted that in developing 14 CFR 121.370a/121.16 requirements, it was the intent of the FAA that the fatigue critical structure as defined in 14 CFR 25.571 must be assessed for damage tolerance.

2) Repairs to Fatigue Critical Structure

14 CFR 121.370a/121.16 also requires that repairs to the fatigue critical structure be assessed for damage tolerance. Repairs that are of interest for compliance to the AASFR are those repairs adversely affecting the fatigue life and inspection of the

fatigue critical structure. To preclude unnecessary DT assessments of repairs, the AAWG has identified certain types of repairs commonly made to the fatigue critical structure that have no adverse affect on the fatigue life and inspection of the structure. Task 1 of the FAA tasking requires an AC be written to provide guidance for developing DT data that operators can use for addressing repairs made to the fatigue critical structure. The AAWG has established AC 120-AAWG "Damage Tolerance Inspections for Repairs" to accomplish this task.

a) Repair Definition

For the purpose of this AC, a repair is defined as the restoration of an item to a serviceable condition in conformity with an approved standard.

The AC establishes provides guidance for determining when repairs need to be evaluated and which repairs will require evaluation. The AC will specify that the evaluation for these repairs be based on 14 CFR 25.571 and AC 25.571-1x (dependant on airplane certification level) and other guidance specific to repairs.

Even though 14 CFR 121.370a and 129.16 could be construed to be applicable to repairs alterations and modifications to composite structure, the AAWG did not specifically develop guidelines for this particular type of structure. There were three principal reasons for this: (1) there is not a significant amount of composite primary structure on airplanes today; (2) most of that structure is on airplanes that were certified to Amendment 45 or later; and (3) the certification process in regards to damage tolerance for composite structure is significantly different than that of metallic structure and are adequately covered by AC 20-107A.

b) Common repairs not affecting the fatigue life and or inspection of fatigue critical structure

For the purposes of the AC, existing repairs that need to be considered are those repairs that reinforce fatigue critical structure (e.g. restore strength); this typically excludes maintenance actions such as blend-outs, plug rivets, trim-outs, etc. The reason behind this limitation is that these maintenance actions are difficult to detect on the airplane and that records of such repairs are not normally kept past the next maintenance visit.

However, after December 20, 2010, blendouts, trim-outs, etc. that are beyond published DAH limits will require damage tolerance assessment as part of the compliance requirements to the AASFR.

c) Airplane Maintenance Manual/Component Maintenance Manual Restorations and Reworks

Manufacturers produce and distribute maintenance manuals for reworks, restorations and maintenance tasks for structural components conducted on and off airplane. The data and procedures contained in these manuals are FAA accepted procedures and have not necessarily been FAA approved.

The Airplane Maintenance Manual (AMM) directs maintenance tasks that can be accomplished on-airplane. This includes items such as lubrication system functional checks and servicing of the airplane. Structure repairs and modifications are not generally included in this manual except under special circumstances.

The Component Maintenance Manual (CMM) directs maintenance of components off-airplane. The maintenance tasks contained in this manual establishes accepted procedures for restoring a structural component to a serviceable state. As such, rework allowables along with refinishing procedures are often contained in this manual. Airlines can use this manual to restore components such as flap tracks, hydraulic actuators, and other components to a serviceable state without formal FAA approval.

The AAWG discussed whether or not reworks and restorations conducted under the provision of an AMM or CMM required consideration under the requirements of 14 CFR 121.370a/129.16 for the establishment of DT data. The AAWG concluded that it would be quite difficult to include these component reworks and restorations for the following reasons.

- The reworks and restorations within the limits contained in the DAH published AMM/CMM are reviewed by engineering and have not been known to adversely affect the life of the components.
- Certificate Holders are routinely allowed to modify the AMM/CMM based on service history with or without consulting the OEM. This has resulted in differing configurations for different certificate holders making the determination of a reworked baseline configuration difficult if not impossible to determine.
- A restored component, on airplane, would have no physical attributes to indicate that it had been reworked.
- Procedures for tracking the life or service history of a component, even if serialized, have not always been established or followed.
- In some cases a rework record of the component is not obtainable.
- Components from one airline could be interchanged with another airline.

After considering these points, the AAWG concluded that this issue should not be considered under the requirements of 14 CFR 121.370a/129.16 since inclusion of these reworks and restorations would be impossible to assess for compliance by December 20, 2010. The AAWG however believes that further review on this subject is advisable and recommends that the FAA issue a tasking to ARAC to investigate the status of the AMM and CMM and make appropriate recommendations.

d) Repairs to Removable Structural Components

Fatigue critical structure may include structure on removable structural parts or assemblies that can be exchanged from one aircraft to another (e.g. door assemblies, flight control surfaces, etc.). Therefore, repairs to such fatigue critical structure also require assessment for damage tolerance per 14 CFR 121.370a/121.16. While the general approach to assessment of these repairs is no different than for repairs to fixed structure, the AAWG found that removable structural parts present unique issues. These issues include:

- During their life history, these parts may not have had their flight times recorded on an individual component level. Additionally, they may have been removed and reinstalled on different airplanes multiple times. These actions may make it impossible to determine the actual age or total hours/cycles of a component or of a repair to a component. It also makes assigning a conservative age based on the component manufacturing date difficult (as is often done with fixed structure).

- Due to lack of clear guidance, there has been confusion in the industry regarding the need to track individual affected components under programs such as SSID or ALS. In many cases, the program rules could be interpreted to mean all requirements were tracked at the aircraft level even though some individual components were affected.

As a result of these findings, the AAWG concluded that additional guidance was necessary for repairs to removable structural components that were affected by the requirements of 14 CFR 121.370a/129.16. This guidance was included in AC 120-AAWG and addressed the issues listed above. In keeping with the theme of the tasking, a goal was to also provide guidance that gives flexibility and reduces operator burden when implementing DT data for repairs to structural components.

The guidance for removable structural components uses the same DT data development and implementation process applied to repairs on fixed structure; however, it gives tracking guidance and methods for conservatively assigning a component age. In developing this guidance, the AAWG considered existing industry approved recommendations for addressing removable structural components (Reference (3.f) – ATA Report 51-93-01, Section 4.6)

B. Task 1 Elements

Within Task 1, ARAC requested that the AAWG review and comment on several elements in preparation for the development of advisory material. The AAWG reviewed and commented on each of these elements below.

1) AC 91-56B Recommendations

The AAWG was requested to review the Draft AC 91-56B (Reference (2.h)) and assess its ability to provide the necessary guidance for an entity (more than just operator) that is seeking compliance to 14 CFR 121.370a/129.16. In Task 1, the Tasking requests ARAC to do the following for repairs:

In the process of drafting the AC, the ARAC should assess the effectiveness of AC 91-56B to provide guidance to TC and STC holders for developing damage-tolerance-based inspections and procedures for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The ARAC should do the following:

- ***Assess the effectiveness of AC 91-56B to support Industry compliance with the AASIFR with respect to repairs.***

- ***Document any improvements to the AC that would provide better direction with respect to the guidance for TC and STC holders in their development of damage-tolerance-based inspections and procedures for repairs.***

In Task 2, the ARAC was also requested to assess the effectiveness of Draft AC 91-56B to provide guidance for an STC holder in seeking compliance with 14 CFR 121.370a/129.16 for alterations and modifications, and provide recommended changes. While the specific discussion of the AAWG's findings are included in Section 3 of this report, the overall findings and recommendations were the same. Therefore, the recommended changes to Draft AC 91-56B associated with Task 2 were included in this section to avoid duplication or confusion.

a) Discussion of Proposed Changes

The AAWG reviewed Draft AC 91-56B and made a determination that the guidance provided did not provide adequate direction for an entity seeking compliance to 14 CFR 121.370a/129.16. The changes incorporated into Draft AC 91-56B did not address a variety of technical and programmatic issues that an entity would need to address for compliance to the rule. The results of trying to follow the Draft AC 91-56B would most likely result in a varying degree of compliance throughout the industry.

In making comments to the AC, the AAWG viewed Draft AC 91-56 as a top-level roadmap to the aging airplane programs that briefly describe the various programs and points to other ACs that provide specific guidance for each of the respective aging airplane programs. In support of this, the AAWG has developed a Draft AC 120-AAWG that provides guidance to the both the DAH and the operator on an acceptable means of compliance to 14 CFR 121.370a/129.16.

Further differences exist between the new FAA tasking contained in Federal Register Document 04-10816, dated 05-13-04, and the Draft AC 91-56B. The release of the new tasking reflects the FAA's current opinion of applicable structure that requires damage tolerance-based inspection program in accordance with the AASFR, 14 CFR 121.370a/129.16.

i. The Draft AC 91-56B reflects the wording of the Interim Final Rule Reference (3.j), that requires a damage tolerance-based inspection program for all major repairs, alterations and modifications.
ii. The FR 04-10816 requires a damage tolerance-based inspection program that addresses repairs made to aircraft structure and STCs that are susceptible to fatigue cracking that could contribute to catastrophic failure. The wording of FR 04-10816 and the AASFR published on February 2, 2005 are consistent.

b) Recommendations for Revisions to AC 91-56B:

The AAWG recommends that Draft AC 91-56B be revised as noted below. A copy of AC 91-56B with these changes annotated is contained in Appendix C.

i. Page 1, Paragraph 3. RELATED REGULATIONS AND DOCUMENTS.
   (1) Add subparagraph 3.a (4) add Parts 121.368, 121.370, and 121.370(a)
   (2) Add subparagraph 3.a (5) add Parts 121.16, 129.32, 129.33.
   (3) Add sub paragraph 3.b (4) add future AC 120-AAWG.

ii. Pages 4, 5. Paragraph 6.f. SUPPLEMENTAL STRUCTURAL INSPECTION PROGRAMS.
   (1) Page 4, Change first sentence to read, "The operators will be expected to accomplish a damage tolerance based inspection program of all alterations, modifications and repairs made to aircraft structure and STCs that is susceptible to fatigue cracking that could contribute to a catastrophic failure. This is to be done in accordance with the timelines established in the "Aging Airplane Safety" rule.
   (2) Page 5, Change the last sentence, last phrase to read, "... but the "Aging Airplane Safety" rule requires that all alterations, modifications and repairs made to aircraft structure and STCs that is susceptible to fatigue cracking that could contribute to catastrophic failure be considered."

iii. Page 5, Paragraph 7. MANDATORY MODIFICATION PROGRAM.
   (1) Add subparagraph 7.c. stating the "Aging Airplane Safety" rule requires that all modifications that are susceptible to fatigue cracking that could contribute to catastrophic failure be considered.

iv. Page 6, Paragraph 8 (c) CORROSION PREVENTION AND CONTROL PROGRAM (CPCP). Delete this subparagraph as the FAA has withdrawn rulemaking for the CPCP. Include a paragraph that stipulates industry standard practices.

v. APPENDIX 1, Page 1, Paragraph 1 (e).
   (1) Change the first two sentences to read, "The effect of repairs, alterations and modifications approved by the DAH and made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, should be considered. In addition it will be necessary to consider the effect of all repairs and operator or STC-approved alterations and modifications on individual airplanes, which are made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure."

vi. APPENDIX 1, Page 5, Paragraph 6. STRUCTURAL REPAIRS, ALTERATIONS AND MODIFICATIONS.
   (1) Change the first sentence in subparagraph 6.a. to read, "Operators are responsible for ensuring that an assessment is made of all repairs, alterations and modifications (e.g., STCs) to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, to develop a damage tolerance based inspection program that ensures the same confidence as the baseline structure."
   (2) Change the second sentence in subparagraph 6.b. to read, "Repairs, alterations and modifications made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, may invalidate these maintenance programs and would require additional analysis and/or testing."
   (3) Change subparagraph 6.c. to read, "Operators must accomplish a damage tolerance assessment for all new repairs, alterations and modifications to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure."

2) Task 1, Element 1 - Airplane Certification Level

ARAC was requested to examine the following:

The significance of the airplane certification amendment level in providing direction for the development of damage tolerance inspections and methods for repairs.

Airplane certification amendment level provides a number of directions for the development of damage tolerance inspections and methods for repairs. For example, no direction exists for damage tolerance for airplanes certified prior to 14 CFR 25 Amendment 45; in the case of an airplane certified to 14 CFR 25 Amendment 54 and beyond, directions exist.

For the purposes of compliance to the AASFR, a more important question requires answering; that being "what amendment level should a respective airplane be required to show compliance?" The AAWG has considered this issue and provides the following response:

a) AASFR Rule Requirements

14 CFR Parts 121.370a and 129.16 require that *"maintenance programs include damage-tolerance based inspections and procedures for airplane structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure The inspections and procedures must take into account the adverse effects repairs, alterations and modifications may have on fatigue cracking and the inspection of this airplane structure.*"

Alterations and modifications are discussed in Section 3 of this report. This section discusses repairs and repairs to alterations and modifications.

For new and existing repairs, Damage Tolerance Evaluations (DTE) must be accomplished for compliance to the AASFR. Basically, the amendment level of the 14 CFR 25.571 to be considered for this assessment may depend on the certification level of the airplane model, but also on the amendment level of the airworthiness requirements in force at the time of the assessment.

This section establishes the minimum amendment level to be considered for the Damage Tolerance (DT) justifications of repairs in the following categories:

- Existing repairs with an existing DT justification;
- Existing repairs without DT justification, that may require justification in the future;
- Future repairs that will require DT justification.

b) Chronology of 14 CFR 25.571

Table 2.1 summarizes the changes that have occurred to 14 CFR 25.571 and its predecessors since the introduction of commercial large transport category jet airplanes. Historically, the amendment level at time of certification determines the level of analysis required for the as delivered structure and any future repairs not considering the new requirements under 14 CFR 121.370a and 129.16.

TABLE 2.1 – CHRONOLOGY OF CHANGES TO 14 CFR 25.571

Date	Amendment Level	Change
Prior to 1965	CAR 4b – Fatigue Evaluation	Applicant had the option of certifying the structure either fail-safe or safe-life.
February 2, 1965	Conversion of CAR 4b to FAR25 - Fatigue Evaluation	Applicant had the option of certifying the structure either fail-safe or safe-life.
September 10, 1966	Amendment 25-10	Added requirement for sonic fatigue.
May 8, 1970	Amendment 25-23	Added dynamic effect factor of 1.15 on FS strength loads.
December 1, 1978	Amendment 25-45	Replaced the fail-safe requirement with a damage tolerance (fail-safe) requirement. Established inspections to be included in the maintenance manual required by 25.1529
October 14, 1980	Amendment 25-54	Established the Airworthiness Limitations Section of the Instructions for Continued Airworthiness
August 20, 1990	Amendment 25-72	Added PSD gust requirements, removed propellers from discrete source damage
March 11, 1996	Amendment 25-86	Revised gust loads
March 31, 1998	Amendment 25-96	Added requirement for 2-lifetime fatigue test for Widespread Fatigue Damage. Added requirement that inspection thresholds must be determined by crack growth for certain types of structure

The first obvious demarcation line as it relates to the AASFR is 14 CFR 25.571 Amendment 45. Aircraft certified after 14 CFR 25.571 Amendment 45 should theoretically have damage tolerance inspections in place for the type design. All repairs to these aircraft should have been evaluated from a damage tolerance viewpoint and any necessary inspections incorporated into the individual airplane maintenance program. However, industry accepted practices for airplanes certified to 14 CFR 25.571 Amendment 45 have not always provided damage tolerance data for repairs.

The damage tolerance standards established at Amendment 45 were not significantly revised until Amendment 96 which changed the way the inspection thresholds are to be determined:

> "*Inspection thresholds for [certain] 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."

14 CFR 25.571 Amdt 25-96 "Damage-tolerance and fatigue evaluation of structure" (1998).

As a result, airplanes certified to 14 CFR 25.571 Amendment 96, conventional 'fatigue' analysis for determination of threshold has been restricted for new certification programs in the USA. Other regulatory authorities have yet to codify a similar requirement.

Airplanes certified prior to Amendment 45 do not have damage tolerance based inspection programs unless they were added at a later time through the SSID and RAP programs.

c) Damage Tolerance Evaluation of Structural Repairs

For an aircraft structural repair, the current policy is:

"*The structure is then restored to the original certification status; either safe-life, fail-safe, or damage tolerant and approved in accordance with established procedures.*"

FAA Advisory Circular 25.1529-1 "Instructions for Continued Airworthiness of Structural Repairs on Transport Airplanes" (1991).

In other words, it must be ensured that damage tolerant structure will remain damage tolerant after it has been repaired. The damage tolerance justifications are performed according to the amendment level in force at the time of the original type certification.

Repairs made to Airplanes certified prior to Amendment 45 are not currently required to have damage tolerance justified repairs unless those repairs are made to structure that has been identified under AD mandated SSID programs or otherwise required by 14 CFR 121.370. Repairs to the SSID/P structures use 14 CFR 25.571 Amendment 45 as a basis for the determination of DT data.

d) Changed Product Rule

The basic policy may be modified by the 'Changed Product Rule (CPR)', which is intended to enhance safety through the incorporation of the latest amendments in the certification level of changed products:

"*An applicant for a change to a Type Certificate must show that the changed product complies with the 14 CFR 25 that are applicable to the changed product and that are in effect at the date of the application for the change.*"

14 CFR 21.101 "Designation of Applicable Requirements"

The CPR is applicable only to significant changes to products, and does not strictly apply to structural repairs unless the repair is done on structure certified using an amended certification level as determined by the CPR.

e) 14 CFR 25.571 Amendment Level For Compliance to the AASFR

Based on the discussions above and for the purposes of finding compliance to 14 CFR 121.370a/129.16, the AAWG recommends that the following basic policy be used for future damage tolerance evaluations for repairs:

TABLE 2.2 - 14 CFR 25.571 AMENDMENT LEVEL FOR COMPLIANCE TO THE AASFR

25.571 Airplane/STC Certification	25.571 Repair Certification
Pre Amendment 45	Amendment 45
Amendment 45, or later	Airplane/STC Certification Level

3) Task 1, Elements 2 and 3 - Effectiveness of SSID/P and ALS Programs to provide DT data for Repairs

ARAC was asked to consider the following two issues:

A. The degree to which Supplemental Structural Inspection Documents/ Programs (SSID/P) or equivalent documents/programs provide direction to repair the structure using damage-tolerance-rated repairs. The assessment should apply to SSID/Ps or equivalent documents/programs developed for 14 CFR part 25 pre-amendment 25–45 transport airplane models having a maximum gross takeoff weight of 75,000 lbs or greater. The following should be identified:

- ***Areas of aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by SSID/ Ps or equivalent documents/programs***
- ***Significant assumptions applied in developing SSID/Ps or equivalent documents/programs***
- ***Any significant issues in the implementation of the requirements of SSID/Ps or equivalent documents/programs***
- ***Data from SSID/Ps or equivalent documents/programs that would be useful in supporting this new tasking***

B. The degree to which an applicable airplane model's Airworthiness Limitations Section (ALS) provides direction to repair the structure using damage-tolerance-rated repairs. This assessment should apply to damage-tolerance-based inspection programs/ data developed for 14 CFR part 25 amendment 25–45 or later transport airplane models having a maximum gross takeoff weight of 75,000 lbs or greater. The following should be identified:

- ***Areas of aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by a damage-tolerance-based inspection program/data***

- ***Any significant issues in the implementation of the requirements of the damage-tolerance-based inspection programs/data***
- ***Data from the damage-tolerance based inspection programs that would be useful in supporting this new tasking***

The AAWG has examined these issues and responds with the following:

a) SSID/P and ALS Program Description

Supplemental Structural Inspection Documents/Programs (SSID/P) or equivalent documents/programs and the Airworthiness Limitations Section (ALS) of the Instructions for Continued Airworthiness provide inspections of Principal Structural Elements (PSEs) based on damage tolerance evaluations. Both the SSID/P and ALS were developed to support the continued airworthiness of airplanes. SSID/P programs are for airplanes certified prior to Amendment 45 of 14 CFR 25 and are based on the guidance given in AC 91-56A (Reference (2.g)). ALS programs have been developed for airplanes certified to Amendment 45 of 14 CFR 25 or later and are based on the guidance given in AC 25.571-1C and 14 CFR 25.1529.

The SSID/P and ALS were developed to define damage tolerance based inspections and are considered an acceptable means of compliance with the AASFR for the baseline structure. Further investigation must be done to determine fatigue critical structure so that that structure, when repaired, receives appropriate attention.

The SSID/P and ALS programs provide inspections on a limited number of structural areas of the airplane. The assumptions made in determining the areas to be inspected by OEMs contained in the SSID/P and ALS must be understood so that the determination of the fatigue critical structure required by §§ 121.370a and 129.16 is correct. It is likely that only the structure requiring supplemental inspection is included in the SSID/P and ALS documents. Structure that does not require supplemental inspection may also be classified as 'fatigue critical structure' since this structure's continued airworthiness is being controlled under a FAA approved normal maintenance program. Fatigue critical structure may require evaluation for supplemental inspections if repaired, altered or modified.

b) SSID/P or ALS Program Assumptions

In order for a SSID/P or ALS to be developed, a number of assumptions are required, including but not limited to:

i. Determination of PSEs,
ii. Stresses used for analysis,
iii. Airplane utilization,
iv. Size of initial flaws,
v. Probability of crack detection,
vi. Environment of the structure,
vii. Material properties and,

viii. Crack propagation methodology.

These assumptions are normally documented and approved by the FAA and provide a level of confidence in maintaining the continued airworthiness of the fleet. Any significant deviation from these assumptions can cause the effectiveness of the programs to change. Deviations include and are not limited to different airplane utilization, modifications and repairs.

Different airplane utilization may include length of flight, payload weight, cabin altitude, flight altitude, airplane retirement and predominant environment. Each of these could have a significant impact on the program. For example airplane retirements could impact the group of airplanes that are available for inspection in a program that samples the airplanes.

For those pre-amendment 45 airplanes, various manufacturers have produced and published SSID programs (See Reference (3.e)).

c) Normal Maintenance Issues

As previously discussed, normal maintenance is relied upon for a portion of the fatigue critical structure that does not require directed inspections. There were specific assumptions regarding normal maintenance contained in the SSID/P and ALS approvals. Those assumptions are relied upon to provide the necessary frequency and type of inspections to maintain continued airworthiness after the SSID/P or ALS threshold for a large portion of the fatigue critical structure. It is common practice within the industry to escalate maintenance intervals as experience with the airplane and its operational environment become better known. It is important for those entities seeking compliance to 14 CFR 121.370a/129.16 to understand those assumptions and make the appropriate adjustments to the normal maintenance program at the SSID/P or ALS threshold. Some ALS programs already require this adjustment.

d) Status of SSID/P and ALS Programs by Airplane Model

Table 2.3 summarizes the current status of all Airbus and Boeing SSID/P and ALS programs.

TABLE 2.3A – AIRPLANES WITH SSID AD DTA REQUIREMENTS FOR REPAIRS ALTERATIONS AND MODIFICATIONS

Airplane / AD Number	FAR 25/25.571 Amdt	DTA of New Repairs		DTA of Old Repairs	AC 25.1529-1 applies	AD addresses Alterations or Modifications
		Before SSID Program Threshold	After SSID Program Threshold			
727 (All) / 98-11-03 R1	CAR 4b/Pre FAR	Yes	Yes	At Threshold	Yes – except for AD	Yes
737 (100 & 200) / 98-11-04 R1	15/0	Yes	Yes	At Threshold	Yes – except for AD	Yes
737 – 300, 400, and 500 AD Pending	51/0	No at this time	Yes Fuselage / RAP	Yes Fuselage / RAP	AD will specify Compliance Requirements	N/A
747 (All) / 2004-07-22	39/0	No	Yes	At Threshold.	Yes – Initial approval "FAA" then final approval needs AMOC.	Yes – needs AMOC.
A300 (B2-1A, B2-1C, B2K-3C, B2-203 B4-2C, B4-103, & B4-203) / 96-13-11	20	Yes*	Yes*	N/A	Yes	N/A
DC-8 (All) 93-01-15	0/0	No	Yes only if per AD	Implied	No – needs AMOC or ACO approval	No
DC-9 (10 – 50) / 96-13-03	0/0	No	Yes only if per AD	At Nth	No – needs AMOC or ACO approval	No
DC-10 (All) / 95-23-09	22/10	No	Yes only if per AD paragraph	At Nth AD paragraph	No – needs AMOC or ACO approval AD paragraphs	No

Airplane / AD Number	**FAR 25/25.571 Amdt**	**DTA of New Repairs**		**DTA of Old Repairs**	**AC 25.1529-1 applies**	**AD addresses Alterations or Modifications**
		Before SSID Program Threshold	**After SSID Program Threshold**			
DC-9 (81, 82, 83, 87) & MD-88 / AD 2004-11-07	40/10	No	Yes AD paragraph	Yes AD paragraph	Yes AD paragraph (e) & Note 2. No AD paragraph	Yes AD paragraph

* RAS embodied after 1992

TABLE 2.3B – AIRPLANES WITH ALS DTA REQUIREMENTS FOR REPAIRS ALTERATIONS AND MODIFICATIONS

Airplane / AD Number	FAR 25/25.571 Amdt	DTA of Repairs	AC 25.1529-1 applies	AD addresses Alterations or Modifications
717 (200)	82/72	Yes	Yes	N/A
737- 600, 700, 800	Fuselage and empennage 77/0 Wing 77/72	Yes	AD will specify Compliance Requirements	N/A
737-700C, 900	91/86	Yes	Yes	N/A
757 L/N 1-764 / 2001-20-12	85/45	Yes	Yes	No
757 L/N 765 and beyond	85/45	Yes	Yes	N/A
767 L/N 1-668 / 2001-08-28	89/45	Yes	Yes	No
767 L/N 669 and beyond	89/45	Yes	Yes	N/A
777	(Series 200/300) 86/72 (Series 300ER) 98/96	Yes	Yes	N/A
A300 (600)	45/45	Yes*	Yes	N/A
A310	45/45	Yes*	Yes	N/A
A318	86/86	Yes	Yes	N/A
A319	86/86	Yes	Yes	N/A
A320	54/54	Yes*	Yes	N/A
A321	54/54	Yes	Yes	N/A

Airplane / AD Number	FAR 25/25.571 Amdt	DTA of Repairs	AC 25.1529-1 applies	AD addresses Alterations or Modifications
A330	72/72	Yes	Yes	N/A
A340	72/72	Yes	Yes	N/A
MD-10 (10F & 30F)	Structure not affected by change - Same as DC-10 Structure affected by change 89/86	No** AD Pending	Yes	N/A
MD-11 (All)	61/54	Yes	Yes	N/A
MD-90 (30) / 97-11-07	70/54	Yes	Yes	N/A

* RAS embodied after 1992

** AD will specify Compliance Requirements

e) Summary and AAWG Recommendations

i. Those areas of the fatigue critical structure that require supplemental inspections are listed in the SSID/ALS. Areas of the fatigue critical structure not listed in the SSID/ALS will require evaluation for supplemental inspections if repaired, altered or modified.

ii. If an operator has escalated his baseline maintenance structural task intervals, an adjustment to operator's baseline maintenance program may be necessary at SSID/P or ALS thresholds, depending on the assumptions used to establish the SSID/P and ALS.

iii. There is little consistency between the various SSID/P and ALS programs relative to how those programs provide direction to repair the structure using damage-tolerance-rated repairs. Further review has established that the AASFR will provide the means to provide consistency in the handling of repairs to SSID/P and ALS structure.

iv. The SSID/P and ALS programs were developed to address the un-repaired fatigue critical structure and do not consistently provide instructions for repairs to that structure. Therefore, the AAWG has concluded that there is no data from the SSID/P and ALS programs which are specifically useful in supporting the new tasking.

v. The AAWG recommends that the model-specific Compliance Documents described in proposed AC 120-AAWG contain a statement which confirms that the FAA-approved SSID/P or ALS for that airplane model is an acceptable means of compliance for the AASFR, for the baseline structure of that airplane model.

4) Task 1, Element 4 - Effectiveness of RAP Documents in providing DT data

ARAC was asked to consider the following concerning Repair Assessment Programs:

The degree to which existing Repair Assessment Guideline documents developed for §§ 121.370 and 129.32 provide damage-tolerance-based inspections for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The assessment should identify the following:

- ***Areas of the aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by these documents***
- ***Data from these documents that would be useful in supporting this new tasking***

The AAWG has considered this issue and provides the following response:

a) RAP Program Description

On December 9, 2002, a requirement for a Repair Assessment Program (RAP) (14 CFR 121.370 - Amdt. 121–295, 67 FR 72834) requiring DT data for repairs to the fuselage pressure boundary was introduced for 11 airplane types. These 11 types were all certified to pre-Amendment 45 to 14 CFR 25, including:

- Airbus A300
- BAC 1-11
- B707/720
- B727
- B737
- B747
- F-28
- L1011
- DC-8
- DC-9/MD-80
- DC-10

The RAP is a program that is limited to repairs of the fuselage-pressurized boundaries (fuselage skin, door skin and bulkhead webs). The programs were developed based on a series of studies conducted for the FAA by the Airworthiness Assurance Working Group (See Reference (3.a)). The study conducted two surveys of airplanes in 1992 and 1994 in which 1051 repairs installed on 65 airplanes of 9 different models were assessed. The major conclusions of the assessment were that

- 60% of the repairs would need damage tolerance evaluation,
- Majority of the repairs were on the fuselage (less than 10% on other structure),
- There were no immediate safety concerns, and
- Old aircraft had more repairs.

Based on these studies the AAWG concluded that repairs to the fuselage pressure boundary were of the highest priority for potential problems that could affect continued airworthiness.

Operators who have adopted an FAA approved assessment procedure in their maintenance programs are fully compliant with the requirements of the AASFR for the structure identified in the assessment programs. To be in compliance to AASFR, other components of the fuselage not covered would require FAA approved programs.

A model specific RAP document (Reference (3.d)) developed in accordance AC120-73 (Reference (2.i)) provides guidance to determine the inspection threshold, interval and method for each repair as required. Repairs that have been assessed according to these guidelines are in compliance with the requirements of the AASFR. Repairs that go beyond the scope of the RAP document or other approved data (such as SRM) may require additional regulatory approvals in defining the maintenance requirements for compliance to the AASFR.

b) ATA Assessment of AASIFR Impact to Industry

The ATA, in responding to the December 2002 publication that promulgated the Aging Airplane Safety Interim Final Rule (AASIFR), indicated that approximately 142,600 repairs (on Boeing Airplanes alone) and 3300 STCs would need to be assessed for damage tolerance under the requirements of the AASIFR (Reference (3.g)). There is a need to determine whether a RAP program generalized to all fatigue critical structure would be an effective means to support operator compliance as opposed to reviewing and providing DT data on an individual repair-by-repair basis.

The AAWG recommends that the technical and economic merits of a generalized RAP program for all fatigue critical structure be considered and developed if feasible. In all cases, the operator must have the necessary data to show compliance by December 18, 2009.

c) Requirements on Other Airplanes Not Affected By RAP

In regard to the fuselage pressure boundary, all other aircraft types / models are still required to comply with AASFR. Damage tolerance assessment methods and inspection procedures will need to be introduced for repairs accomplished on these aircraft.

d) AAWG Critique of the RAP Program

The consensus of the AAWG is that the development of the RAG documents for the Fuselage Pressure Boundary Repairs was vital for the implementation of this program. The success of the 14 CFR 121.370 program can be attributed to the cooperation of all segments of the industry including the FAA, operators and manufacturers.

Considering the newness of the program only very limited data is available that provides some insight as to the effectiveness of the RAG documents. Three operators were surveyed concerning how successful the RAG documents had been in assessing repairs to the fuselage pressure boundary. The application of these programs is limited to the older airplanes and there is only limited experience available. The results of this survey are encouraging in that the process assessed and provided DT data for a large percentage of the repairs. The Table 2.4 documents the results of the survey

TABLE 2.4 – SUMMARY OF RAG DOCUMENTS REPAIR CATEGORIZATIONS

Airline	Number of A/P	Average No of Repairs per A/P on the Fuselage Pressure Boundary	Percentage Successfully Assessed per A/P using RAG Documents
A	60	37	70%
B	48	71	91%
C	N/A	N/A	50%

The operators provided the OEMs with a critical review of the existing RAP documents developed for operator compliance to 14 CFR 121.370. It was pointed out that the operators were still relatively new to the document and that not many airplanes currently required assessment. The operators defined four main issues that they would like to be resolved for each of the two OEMs. The following summarizes their positions:

TABLE 2.5 – RAP PROGRAM IMPROVEMENTS

AIRBUS	BOEING
Provide Flexible Inspection Options	Automate the Process
Automated/Simplified Process	Provide Flexible Inspection Options
Improved navigation/document layout	Include Removed/Superceded SRM Repairs with DTA Information
Provide BZI/MPD Correlation	Provide BZI/MPD Correlation

The operators pointed out that by making these adjustments to the existing RAP, the OEM would effectively reduce the number of repairs that would require evaluation by the OEM or third party.

e) AAWG Conclusions and Recommendations

i. Fuselage RAP programs are successful

ii. The AAWG recommends that the technical and economic merits of a generalized RAP program for all fatigue critical structure should be considered and developed if feasible. In all cases, the operator must have the necessary data to show compliance by December 18, 2009.

iii. For those airplanes certified to Amendment 45 or later where repairs to the fuselage pressure boundary were not provided with DT data, it is recommended that a Fuselage RAP program be developed in accordance with the guidance provided in AC 120-73.

5) Task 1, Element 5 - Comparison of Approaches used to require DT data for repairs in SSID/P areas.

ARAC was asked to consider the following:

Identify the issues/difficulties industry has encountered with establishing damage-tolerance-based inspections and procedures for repairs as required by various FAA approaches in issuing SSIP airworthiness directives (e.g., 727/737 AD 98–11–03 R1, AD 98– 11–04 R1 verses other SSIP AD approaches like the 747). The assessment should identify the following:

- ***Comparison of approaches with pros and cons for each approach***
- ***Data from these documents that would be useful in supporting this new tasking***

The AAWG has considered this issue and provides the following response:

The various approaches adopted in the promulgation of the SSID ADs will have no effect on compliance requirements of the AASFR. The approach of the 727 and 737 SSID ADs relative to existing repairs are, in practice, very similar to the approach outlined in proposed AC 120-AAWG. With regard to the approach the FAA chose to take on the 747 SSID, the AAWG determined that no useful guidance was given with respect to the requirements for DTA on repairs. In effect the AD only addresses inspectability issues with repairs that would hinder SSID inspections.

6) Task 1, Element 6 - Effectiveness of SRMs in providing DT data

ARAC was asked to consider the following:

The extent to which Structural Repair Manuals (SRM) provide damage-tolerance-based inspections for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

The AAWG has considered this issue and provides the following response:

The inclusion of DT based inspections in Structural Repair Manuals (SRMs) is based on the certification amendment level of the airplane or otherwise required by rules such as 14 CFR 121.370 or ADs that mandate programs like the SSID. Repairs to airplanes certified prior to 14 CFR 25 Amendment 45 have not been assessed for damage tolerance. However, all repairs contained in the SRMs for airplanes certified to 14 CFR 25 Amendment 45 or later are generally designed to be damage tolerant. SRMs for these airplanes, may or may not document DT based inspections. For repairs that are in the SRM and do not have DT based inspections documented, safety is ensured, in part, by the normal maintenance programs supplemented by inspections required by either the SSID or ALS. With the requirements of 14 CFR 121.370a and 129.16, each of the Model Specific SRMs will need to be reviewed and updated to include DT inspections, if needed, for all repairs to fatigue critical structure. Tables 2.6 through 2.8 document the current status of SRMs for certain large category airplanes subject to the AASFR.

TABLE 2.6 - AIRBUS SRM AND INDIVIDUAL REPAIR DT STATUS

Airplane Model	***FAR 25.571 Cert. Level***	***Current SRM Repairs***	***New Incorporated SRM Repairs***	***SRM DT Fully Compliant***[3]	***Individual Repairs DT Status***		
					OLD	CURRENT	FUTURE
A300	25-10	DT[1]	DT	2008	Since 92[2]	DT	DT
A300-600	25-45	DT[1]	DT	2008	Since 92[2]	DT	DT
A310	25-45	DT[1]	DT	2008	Since 92[2]	DT	DT
A 318	25-86	DT[1]	DT	2008	DT	DT	DT
A 319	25-86	DT[1]	DT	2008	DT	DT	DT
A 320	25-54	DT[1]	DT	2008	Since 92[2]	DT	DT
A 321	25-54	DT[1]	DT	2008	DT	DT	DT
A330	25-72	DT	DT	Today	DT	DT	DT
A340	25-72	DT	DT	Today	DT	DT	DT

1. All repairs Damage Tolerant, Some repairs may lack specific DT based maintenance inspection requirements
2. Covered by AIRBUS Repair Design Approval Sheet
3. SRM contains DT based maintenance inspection requirements for all repairs

TABLE 2.7 - BOEING SRM AND INDIVIDUAL REPAIR DT STATUS

Airplane Model	***FAR 25.571 Cert. Level***	***Current SRM Repairs***	***New Incorporated SRM Repairs***	***SRM DT Fully Compliant[6]***	***Individual Repairs DT Status***		
					OLD	CURRENT	FUTURE
B 707	CAR 4b	No	No	?	DT[5]	DT[5]	2010
B 727	CAR 4b	DT[5]	DT[5]	2009	DT[5]	DT[5]	2010
B 737 CL	Amdt 0[1]	DT[5]	DT[5]	2009	DT[5]	DT[5]	2010
B 737-600/-700/-800 Fuselage and Empennage	Amdt 0	DT[5]	DT[5]	2009	DT[5]	DT[5]	2010
B 737-600/-700/-800 Wing	Amdt 72	DT	DT	2009	DT[4]	DT[4]	DT[4]
B 737-700C/-900	Amdt 86	DT[5]	DT	2009	DT[4]	DT[4]	DT[4]
B 747	Amdt 0[2]	DT[5]	DT[5]	2009	DT[5]	DT[5]	2010
B 757	Amdt 45	DT[5]	DT	2009	DT[4]	DT[4]	DT[4]
B 767	Amdt 45	DT[5]	DT	2009	DT[4]	DT[4]	DT[4]
B 777	Amdt 72[3]	DT	DT	At TC	DT[4]	DT[4]	DT[4]
DC-8	CAR 4b	DT[5]	DT[5]	2009	DT[5]	DT[5]	2010
DC-9	CAR 4b	DT[5]	DT[5]	2009	DT[5]	DT[5]	2010
DC-10	Amdt 10	DT[5]	DT[5]	2009	DT[5]	DT[5]	2010
MD-80	Amdt 10	DT[5]	DT[5]	2009	DT[5]	DT[5]	2010
MD 11	Amdt 54	DT	DT	At TC	DT[4]	DT[4]	DT[4]
MD-90	Amdt 54	DT	DT	At TC	DT[4]	DT[4]	DT[4]
B 717	Amdt 72	DT	DT	At TC	DT[4]	DT[4]	DT[4]

1. Strut on 737-300/-400/-500 DT Cert level is Amdt 45
2. Strut on L/N 1047 and on DT Cert level is Amdt 45
3. 300ER DT Cert level is Amdt 96 (has equivalent safety finding for WFD
4. May be limited to assessment of a threshold where supplemental inspections are required.
5. All repairs Damage Tolerant, Some repairs may lack specific DT based maintenance inspection requirements
6. SRM contains DT based maintenance inspection requirements for all repairs

TABLE 2.8 - OTHER MANUFACTURERS SRM AND SB DT STATUS

Airplane Model	*25.571 Cert. Level*	*Baseline Structure*	*SRM Status*	*SBs DT Fully Compliant*
SAAB 340/2000	Post 54	Cert Level- ALS	DT rated	DT rated
CL-600	Post 45	Cert Level - ALS	DT rated	DT rated
CASA CN-235	*	*	*	*
DHC-8	Post 54	Cert Level	DT rated	DT rated
DHC-7	Pre-45	Mini SSIP- AD Issued	Not DT rated	Not DT rated
DO 328-100/300	Post 54	Cert Level	DT rated	DT rated
ATR 42/72	54	Cert Level - ALS	DT rated	DT rated
EMB 135/145	Post 54	Cert Level - ALS	DT rated	DT rated
BAE146-100/200	45	Cert Level	Not DT rated	Not DT rated
BAE146 AVRO & -300	54	Cert Level	Not DT rated	Not DT rated
F-27 Basic	Pre 45	SSID	Not DT Rated	Not DT Rated
F-28 Basic	Pre 45	SSID	DT Pressure Boundary	DT Pressure Boundary
Fokker 50/70/100	Post 54	Cert Level -ALS	DT Rated	DT Rated
CV [3]580STC/[3]640STC	Pre 45	No SSID	Not DT rated	Not DT rated
BAE Jetstream-4100	Post 54	Status is pending	Status is pending	Status is pending
Lockheed L-1011	25-10	*	*	*
Lockheed L-188	*	*	*	*
Lockheed L-382	*	*	*	*
EMB 120	Pre 54	Cert Level-ALS	DT Rated	DT Rated

* Information was requested but not received from the DAH

7) Task 1, Element 7 - The need to require DT data in TC and STC Holder Issued Service Bulletins

ARAC was asked to consider the following:

Assess the need to include damage-tolerance-based inspections and procedures in TC and STC Holder issued Service Bulletins (SB) that provide repair instructions for aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

The AAWG has considered this issue and provides the following response:

The requirement for inclusion of DT data in service bulletins is driven by the certification level of the airplane and in some cases, the amended certification level as established by an Airworthiness Directive. With some exceptions, airplanes certified to Amendment 45 of 14 CFR Part 25 (or higher) require Service Bulletin modifications to primary structure to have DT data included within the SB instructions. The AASFR will place further requirements to have SBs that are damage tolerant for all areas of fatigue critical structure. With the requirements of 14 CFR 121.370a and 129.16, each of the Model Specific SBs will need to be reviewed and DT data provided for repairs to fatigue critical structure. Table 2.9 and 2.10 documents industry status on Service Bulletin information. Note: Some manufacturers information is contained in Table 2.8.

TABLE 2.9 - SB DT STATUS AIRBUS

Airplane Model	25.571 Cert. Level	Current SBs [3]	New SBs [3]	SBs DT Fully Compliant
A300	25-20	DT	DT	As part of life extension[1]
A300-600	25-45	DT	DT	From TC[2]
A310	25-45	DT	DT	From TC[2]
A 318	25-86	DT	DT	From TC
A 319	25-86	DT	DT	From TC
A 320	25-54	DT	DT	From TC[2]
A 321	25-54	DT	DT	From TC
A330	25-72	DT	DT	From TC
A340	25-72	DT	DT	From TC

NOTES:
1. Mod. Since SSID, repairs after life extension
2. Mod. Since TC, repairs after life extension
3. SB review necessary during life extension exercise

TABLE 2.10 - SB DT STATUS BOEING

Airplane Model	25.571 Cert Level	Current SB[5]	New SB[5]	SB DT Fully Compliant
B 707	CAR 4b	No	Partially DT	?
B 727	CAR 4b	Partially DT	Partially DT	2009[4]
B 737 CL	Amdt 0[1]	Partially DT	Partially DT	2009[4]
B 737-600/-700/-800 Fuselage and Empennage	Amdt 0	Partially DT	Partially DT	2009[4]
B 737-600/-700/-800 Wing	Amdt 72	DT	DT	2009[4]
B 737-700C/-900	Amdt 86	DT	DT	2009[4]
B 747	Amdt 0[2]	Partially DT	Partially DT	2009[4]
B 757	Amdt 45	Partially DT	DT	2009[4]
B 767	Amdt 45	Partially DT	DT	2009[4]
B 777	Amdt 72[3]	DT	DT	At Cert
DC-8	CAR 4b	Partially DT	Partially DT	2009
DC-9	CAR 4b	Partially DT	Partially DT	2009
DC-10	Amdt 10	Partially DT	Partially DT	2009
MD-80	Amdt 10	Partially DT	Partially DT	2009
MD 11	Amdt 54	DT	DT	At TC
MD-90	Amdt 54	DT	DT	At TC
B 717	Amdt 72	DT	DT	At TC

NOTES:
1. Strut on 737-300/-400/-500 DT Cert level is Amdt 45
2. Strut on L/N 1047 and on DT Cert level is Amdt 45
3. 300ER DT Cert level is Amdt 96 (has equivalent safety finding for WFD)
4. SBs or document containing DT data for each SB
5. All Service Bulletins will need a review no matter what the certification level is.

C. Discussion of AC

1) Method of Approach – DAH Compliance Document and Operator Implementation Plan

a) Why the AAWG chose to utilize an ACO approved data package (DAH Compliance Document)

In developing an approach that would facilitate the operators' timely compliance with the AASFR with respect to repairs, the AAWG determined that it would be necessary for operators to have access to an ACO approved data package containing the DT data required for compliance. This data package, termed "Compliance Document", would contain a listing of available DT data, developed by a DAH, and a means to obtain FAA Approved DT data, for unique repairs. The compliance document would be submitted to the FAA ACO for approval. This process is similar in principle to that conducted by Type Certificate Holders in support of operator compliance with the § 121.370 Repair Assessment Rule.

The compliance documentation developed by the DAH and approved by the ACO would encompass all fatigue critical structure, including repairs and repairs to Repairs, Alterations, and Modifications (RAM) as necessary, and should include implementation schedule information. The listing of available DT data and the means to obtain data for unique repairs should provide the data necessary to support an operator's development of an Implementation Plan. An ACO approved Compliance Document will facilitate the operators' ability to identify and incorporate into their maintenance program the DT data necessary to support compliance with §§ 121.370a and 129.16.

b) Why the AAWG Chose to Utilize a PMI Approved Operator Implementation Plan

In addition to the need for operators to have access to ACO approved data packages (Compliance Documents), the AAWG also recognized the need for an Implementation Plan for operators to incorporate DT data from the Compliance Documents into the existing maintenance program. The incorporation of an Implementation Plan into a certificate holder's FAA-approved maintenance program is subject to approval by the certificate holder's Principal Maintenance Inspector (PMI) or other airworthiness inspector responsible for oversight of an operator.

2) DAH/Operator Work Split – Expected STG Activities

The Structures Task Group (STG) process as defined in Reference 3.i has been used successfully to implement aging airplane recommendations to model specific airplanes. These model-specific STGs will be used to support compliance with 14 CFR Parts 121.370a and 129.16. The model specific STG process should be initiated by the DAH well in advance so that Compliance Document will be available in time to facilitate the development of a Implementation Plan by individual operators. In order to initiate the STG process, the DAH will need to prepare some preliminary data for the STG to consider, including:

- Identify the airplane model(s) or airplane serial numbers that the DT data will be applicable to.

- Identify the fatigue critical structure.
- Identify the certification level.
- Identify existing DT data that supports compliance.
- Propose DT data that would need to be developed to support compliance.

The results of these preliminary tasks should be presented to the STG for discussion and agreement. This analysis should contain the rationale of the approach envisaged by the DAH to support compliance with §§ 121.370a and 129.16. It should clearly identify those existing DT data that already supports compliance (e.g. SRMs, RAGs, SBs, ADs), and where additional DT data should be developed. The results of these analyses will be part of the compliance document. The approach to develop these data should be presented, discussed and agreed as part of the STG.

The extent to which RAGs will be developed to cover the fatigue critical structure (versus case by case DTEs) should be addressed. Service feedback, presented by the operators, would be useful to support this discussion. How operators will be informed of the SRM updates and changes should be also discussed as part of the STG.

An implementation schedule for the development of DT data should be proposed by the DAH and agreed by the STG.

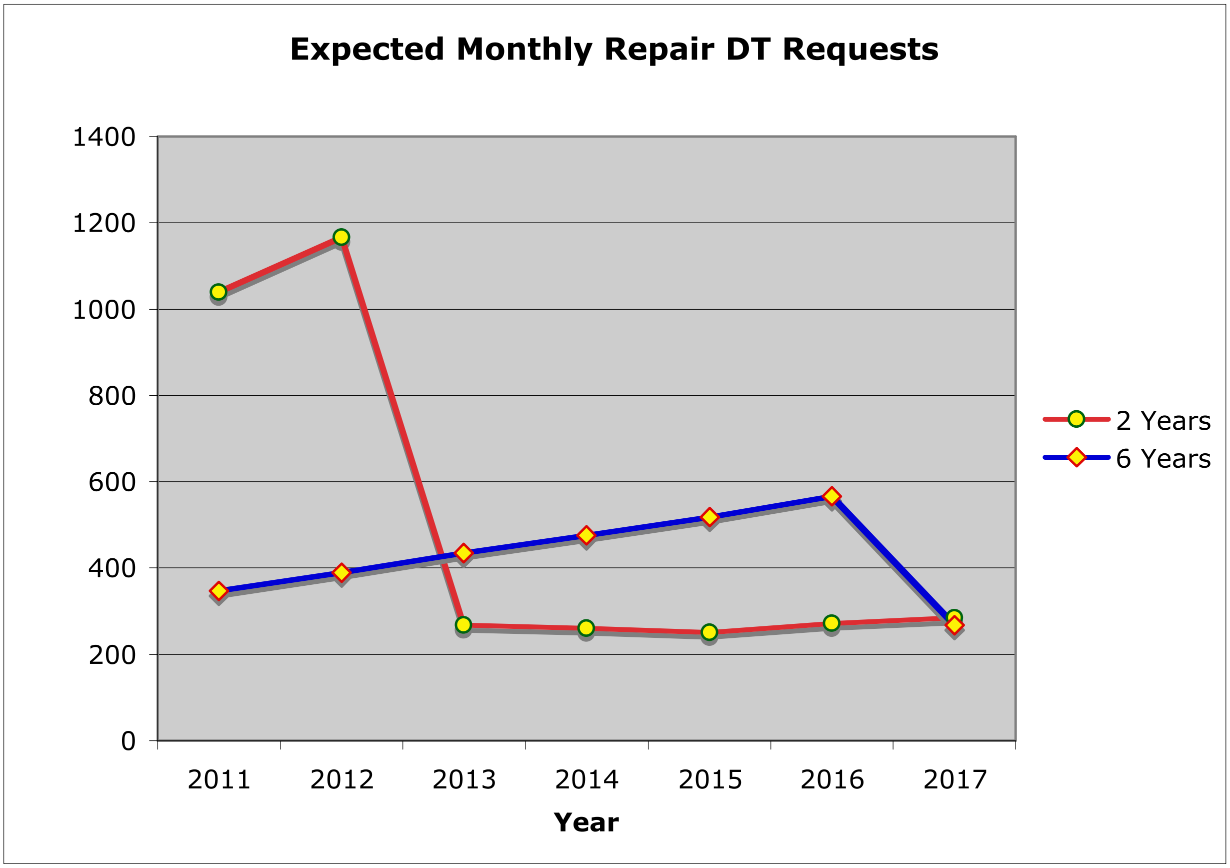
3) Implementation Schedule and Approach

a) Implementation Schedule

In the preamble to the AASFR, the FAA has established that the Repair Assessment Program (RAP) required under 14 CFR 121.370 is an accepted means of compliance for the AASFR for the fuselage pressure boundary. The preamble for the AASFR further states that the FAA expects the new repair assessment guidelines will be consistent with those developed for 14 CFR 121.370. Therefore, the requirements for developing and accomplishing damage tolerance inspections for repairs should not be more restrictive than the requirements for repairs on the pressure boundary, as required by 14 CFR 121.370.

The implementation schedule and approach outlined in AC 120-AAWG, for existing repairs, is patterned after the Repair Assessment Process given in AC 120-73, “Damage Tolerance Assessment of Repairs to Pressurized Fuselages”. However, the AAWG has made a determination that the implementation program described in AC 120-73 most likely would not be able to be supported by the industry. The main reason is that a significant number of airplanes would be beyond the flight cycle DSG on December 20, 2010. This would create a situation where neither the operators, DAHs nor FAA could support the necessary surveys, data development requirements and maintenance program updates because of resource demands created by the expected volume of requests for the damage tolerance requirements for repairs (See Figure 2.1). If the AC 120-73 guidance (next C-check after effective date of the rule for airplanes beyond DSG) is used, the AAWG has estimated that over 750 airplanes (based on US Registered Airplanes active January 1, 2005) would require surveys within two years after December 20, 2010. It is estimated that this could create a backlog of as many as 37,500 repairs per year that requiring DT data whereas only 4500 repairs per year are estimated after the second year of the program. This would create an undue hardship for the industry and may in fact divert resources necessary for the continued airworthiness of aging fleets, resulting in decreased safety.

Figure 2.1 – Implementation Comparison AC 120-73 Versus AAWG Proposed Approach



The AAWG reviewed the data and has proposed a modified approach based on AC 120-73.

i. For airplanes below DSG on December 18, 2009, the proposal is to use the guidance provided by AC 120-73.

ii. For airplanes beyond DSG on December 18, 2009, it is recommended that airplanes are survey on a prorated basis within the established D-check time frame as defined by the Model Specific Structures Task Group. The purpose of prorating is to address the issues above and therefore the operators cannot be allowed to defer the implementation of the program until the end of the D-check time period. For example, if an operator had 30 airplanes over DSG on December 18, 2009 and was operating on a six year D-check equivalent, he would be required to inspect approximately 5 equivalent airplanes each year* until all of the airplanes were inducted into the program (*accounting for normal variations allowed by his Operation Specification). He should not be allowed to defer the required surveys until the end of the D-check or equivalent time period.

The AAWG, in making this recommendation, understands that it represents a change in the way past repair programs have been implemented. As the AAWG studied this issue they recognized that many factors supported an adjustment to the implementation approach. First, it is recognized that the Damage Tolerance Evaluation establishes a supplemental inspection program. That program supplements inspections that are already occurring by virtue of both normal and mandated maintenance programs, such as:

- Instructions for continued airworthiness
- Scheduled maintenance Programs
- SSIDs
- RAP
- Service Bulletins
- Corrosion Prevention and Control Programs

These programs have been effective in detecting repairs that require replacement because of detectable damage.

Second, programs such as the SSID and RAP were developed before a significant number of airplanes were subject to the regulations and therefore provided the industry a means to implement the rules. Those rules also were designed to address repairs that were the most significant to continued airworthiness (fuselage pressure boundary). Pre amendment 45 airplanes are under the requirements of §121.370 that requires operators to incorporate Repair Assessment Guidelines into their maintenance program for repairs to the fuselage pressure boundary. The recommended change in implementation does not affect the implementation program for repairs to the fuselage pressure boundary and only extends to repairs to other fatigue critical structure. For those airplanes certified to Amendment 45 or later, there are a certain number of airplanes that did not receive repairs with damage tolerance data for a period of time. The AAWG has recommended that a RAP type program be developed for the fuselage boundary repairs of those airplanes developed in accordance with AC 120-73. Those programs should be available to the operators on December 18, 2009.

b) Implementation Thresholds Based on DSG

Both AC 120-73 and the proposed AC 120-AAWG provide guidance material which establish the implementation times for accomplishing the repair assessment process as a percentage of the Design Service Goal (DSG) for an aircraft model. The DSG is defined as the period of time (in flight cycles/hours) established at design and/or certification during which the principal structure will be reasonably free from significant cracking. During the development of the Repair Assessment Program for pressurized fuselages, the STG's utilized this guidance to determine the implementation thresholds in flight-cycles that are contained in 121.370. A similar approach should be used for the development of the model-specific Compliance Documents; however, it should be noted that for certain portions of the fatigue critical structure, the rate of crack growth may be governed by flight hours rather than flight cycles. Therefore, these portions of the fatigue critical structure may have a separate implementation threshold given in flight hours.

c) Maintenance program escalation

The rule requires that operators incorporate the damage tolerance inspections and procedures into their maintenance program for all affected aircraft by December 20, 2010. In establishing a DT program, an operator may determine that the existing structural inspection program for a portion of the fatigue critical structure is sufficient to meet damage tolerance inspection requirements for repairs in that area. In this case, if an operator subsequently escalates the structural inspection program based on reliability data, it is the operator's responsibility to ensure that the new inspection interval is sufficient to meet damage tolerance inspection requirements for repairs in that area, or to establish a separate DT inspection task for those repairs. The FAA should ensure that PMIs, who are responsible for operator oversight of maintenance requirements, are aware of the requirements to review repair categories when escalations are requested.

4) Discussion on Adopted "DT" Phrases/Terminology used in the Rule and AC and what it means.

The Rule and AC uses several phrases to define various elements of Damage Tolerance. The purpose of these terms is to distinguish the different elements. There are four different terms used.

- Damage Tolerance Inspections and Procedures
- Damage Tolerance Data (DT data)
- Damage Tolerance Inspections (DTI)
- Damage Tolerance Evaluation Processes (DTE)

The term Damage Tolerance Inspections and Procedures is used in the 14 CFR 121.370a/129.16 rule language. This term is synonymous with the term Damage Tolerance Data (DT data) used extensively in the Advisory Circular.

Damage Tolerance Evaluation (DTE) refers to the process adopted as a means to develop Damage Tolerance Inspections (DTI). A DTE process could entail anything from a rigorous analysis methodology for use by a structures analyst to operator instructions that enable a survey and assessment of existing repairs to be made in a timely manner. And finally Damage Tolerance Data (DT data) refers collectively to the DTE processes and the DTI needed by an operator to address repairs as required by 14 CFR 121.370a/129.16.

5) Disposition and Recommendation Concerning AC 25.1529-1

a) Recommendations regarding the disposition of AC 25.1529-1

The AAWG recommends that AC 25.1529-1 be cancelled and the principal guidance be adopted into the proposed AC 120-AAWG. This proposal is made for two reasons. First, the guidance developed for AC 25.1529-1 uses language that is not uniformly applied and could be confusing. Second, AC 120-AAWG has been developed as the centerpiece for assessment of repairs on airplanes and all guidance material that is relevant should be contained in that document.

b) Three stage approach

Proposed AC 120-AAWG includes a three-stage procedure to gain approval of DT data for repairs. This is different than the two-stage approach contained in AC 25.1529-1. Industry practice, accepted by the FAA and EASA, currently allows a three-stage approach for development and approval of repair data. The three stages can be classified as:

1. Static Strength Approval and return to service
2. Establishment of threshold for inspection within twelve months of return to service
3. Establishment of repeat interval and inspection methodology, where necessary, before the threshold is reached.

The first stage is approval of the static strength data and the schedule for submittal of the DT data. Approval of the static strength component of the repair is required prior to return to service of the airplane. The schedule for the submittal of the damage tolerance data should be no later than 12 months following returned to service of the airplane.

The second stage of the process is the submittal and approval of the DT data that was scheduled in Stage 1. This data might only contain the threshold where inspections are required to begin. If this is the case, the submittal and approval of the remaining DT data may be deferred to the third stage. The operator should have a process in place to ensure that the remaining DT data is obtained and incorporated into his maintenance program before the established threshold.

The third stage is approval of any DT data not submitted in the second stage (typically repeat interval and inspection methodology). This data would need to be submitted and approved prior to the inspection threshold being reached. This would typically involve the inspection method and the repeat intervals.

c) Expectations concerning the control of DTI data within an operators maintenance program

Control of data within an operators maintenance program is crucial to maintaining the airworthiness of the airplane. Data to support a particular repair needs to be identified, tracked, and recorded to ensure proper accomplishment of the data requirements.

Operators are expected to have in place a Quality Control process to ensure proper application of approved data in the repair of an airplane.

i How is the data controlled

Operators are required by 14 CFR 121 to have a method to control data within their organizations. This method supports the requirements for return to service of an airplane after a repair. Included in these procedures are a means to provide detailed instructions to mechanics to perform the repair, track a repair, and schedule for inspection and re-inspection, if required.

(1) The operator should have a process that provides and controls the flow of data to ensure that accurate information is being supplied to mechanics performing the repair, that the data submitted for approval accurately depicts the repair, and a process to track the data when approved to ensure proper actions are taken such as inspections or replacements.

(2) The operator should have a process such as the continuing analysis and surveillance program to ensure that the repair data is being applied as approved, the person applying the repair is properly trained and qualified, and proper data and equipment are available to perform the repair. The quality control function would also ensure that after the repair is accomplished that it was done in accordance with the data that was approved for the repair. If inspections and repeat inspection are required, the quality control function would ensure that proper techniques are applied during the inspection and that if discrepancies are noted they are recorded for corrective action.

ii Tracking Process

A tracking process should be in place that would allow data developed for a repair to be distinguishable and identifiable as to the airplane applicability, techniques to be used, materials needed for the repair, and recording requirements to ensure retention of data.

iii Task card revision and control

If a repair requires inspections or repeat inspections, the operator should have a process in place to develop repair documentation to record these inspections. This documentation may take the form of task cards that contain inspection criteria along with methods and equipment needed. It could take the form of a stand-alone engineering order or repair authorization that would contain similar information. The process should also have a method for maintaining the information on the documentation in a current state. If data approval changes inspection criteria, a revision process should be in place to acknowledge that change and revise the document to reflect the change.

6) Relationship between AC 91-56B, AC 120-73, AC 25.1529-1 and AC 120-AAWG

Several ACs provide guidance in establishing Damage Tolerance based maintenance programs for large transport category airplanes. The proposed AC for this tasking is yet another piece of guidance material that gives guidance on this subject. Whereas previous ACs provided guidance on specific issues, the proposed AC from this tasking utilizes and extends the concepts of the previous ACs for the purpose of establishing airplane level maintenance programs that are based on Damage Tolerance.

Three other ACs were previously published that provide information on Damage Tolerance Based Maintenance Programs.

AC 25.1529-1 – Provides guidance on the means by which repairs to SSID/P PSEs are evaluated for damage tolerance to allow a rapid return to service. This AC was written before the industry had developed an extensive expertise in performing damage tolerance assessments. The AAWG is recommending that this AC be cancelled and incorporated in part into AC 120-AAWG as an Appendix with significant changes.

AC 91-56B – Provides information on Aging Airplane Programs and specific guidance on the development of SSID/P programs. The AAWG has offered the FAA some recommendations on proposed changes to this AC under Paragraph 2.B.1 of this report. This AC is still valid and should be consulted for the development of new SSID/P programs. SSID/P programs develop damage tolerance based maintenance programs for the baseline as delivered primary structure of the airplane and can be used to show compliance to 14 CFR 121.370a/129.16.

AC 120-73 – Provide guidance on development of Repair Assessment Programs (RAP) for the Pressurized Fuselage Boundary. This AC was developed for the industry as a means to show compliance to 14 CFR 121.370, for eleven models of airplanes certified prior to Amendment 45 of 14 CFR 25. This AC is still valid and should be consulted for guidance on developing new RAP programs for any airplane. A RAP program developed under this AC can be used to show compliance to 14 CFR 121.370a/129.16 for the fuselage pressure boundary.

3. Task 2 – Evaluation of Alterations and Modifications for Damage Tolerance

A. Task 2 - Element 1 – Recommendations for Damage Tolerance Based Inspections of Alterations and Modifications

The AAWG was asked to review and comment on:

Prepare a written report assessing how an operator would include damage tolerance-based inspections and procedures for alterations and modifications made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure….

1) Introduction

For the purposes of the proposed AC and this report, the term "alteration" is used to describe a design change and encompasses the term "modification".

There are three categories of alterations that may be installed on a transport category airplane:

a) Supplemental Type Certificates (STCs) – these alterations are normally developed by persons other than the Type Certificate Holder (TCH). They are approved by the FAA under Subpart E of 14 CFR 21.

b) TCH alterations – these are alterations that are developed and approved by the TCH, either through an Amended Type Certificate approved by the FAA under Subpart I of 14 CFR 21, or through FAA-approved service documents such as Service Bulletins.

c) Individual alterations – these are alterations that are developed by and for an operator, which are approved through individual FAA Forms 8110-3 or other means acceptable to the Administrator.

The approach for damage tolerance-based inspections and procedures for alterations will be different for these three categories of alterations.

2) Types of Alterations to be Considered

Any alteration that directly affects the baseline fatigue critical structure must be evaluated regardless of the size or complexity of the alteration. This includes such alterations as SBs produced by the TCH and individual alterations for which an operator obtains FAA approval. The damage tolerance evaluation of an alteration must include both an evaluation of the newly created fatigue critical structure (i.e., does the alteration create new structure susceptible to fatigue cracking which could contribute to a catastrophic failure), and the interaction effects between the altered structure and the baseline fatigue critical structure. These interaction effects may not be limited to the area immediately surrounding the alteration; for instance, an alteration that includes a gross weight increase may significantly affect the magnitude and distribution of external loads on fuselage, wing, empennage, control surfaces, and landing gear structure.

Model Specific Airplane STG should establish a list of STC alterations that could be embodied on fatigue critical structure that should be considered on a model specific basis. The STG should consider the following list as examples of such alterations:

a) Passenger-to-freighter conversions (including addition of main deck cargo doors).
b) Gross weight increases (increased operating weights, increased zero fuel weights, increased landing weights, and increased maximum takeoff weights).
c) Installation of fuselage cutouts (passenger entry doors, emergency exit doors or crew escape hatches, fuselage access doors, and cabin window relocations).
d) Complete re-engine or pylon alterations.
e) Engine hush-kits and nacelle alterations.
f) Wing alterations such as installing winglets or changes in flight control settings (flap droop), and alteration of wing trailing edge structure.
g) Modified skin splices.
h) Any alteration that affects several stringer or frame bays.
i) An alteration that covers structure requiring periodic inspection by the operator's maintenance program.
j) An alteration that results in a change to the operational mission; e.g. significantly changes the manufacturer's load or stress spectrum (passenger-to-freighter conversion).
k) An alteration 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.

3) DAH and STG Activity

The AAWG recommends that the model-specific STG identify any STCs, which may be incorporated on a significant number of airplanes represented by the STG members. If such STCs are identified, the STG should invite the DAH for those STCs to attend and make presentations on the identified STCs and the status of any DT data for those STCs.

Chapter 2.C.2) of this Report describes the data which the DAH will need to provide to an STG to support the development of DT data for repairs. The same basic data will be necessary to support the development of DT data for alterations.

4) Operator/DAH Communication

For STC or TCH alterations, operators will need to contact the DAHs to determine if DT data exists for those alterations. There are three scenarios which are expected to occur:

a) The DAH No Longer Exists. In some cases, the STC may have been surrendered to the FAA.

b) The DAH Exists But Is Unable Or Unwilling To Develop The Data. An STC holder may not have the resources available to develop the data, or may be unwilling to commit the resources to do so. (Note: The FAA noticed (Reference 3.h) their intent to publish a new Subpart to 14 CFR 25 which would require DAHs to make DT data available to operators to support compliance with the AASFR. If this rule were promulgated, then this scenario would force the DAH to make a decision to either develop the data or to surrender the STC to the FAA.)

c) The DAH Exists And Provides The DT Data.

5) Recommended Timeline for Compliance

a) STCs

The AAWG has reviewed the various FAA regulations (SSID ADs) with respect to compliance requirements and timelines for development of DT data for STCs. Based upon that review; the following situations have been identified and need the development of specific timelines.

i) The DAH has developed DT data.
ii) The DAH has not developed DT data, and they will develop the data.
iii) The DAH has not developed the DT data, and they will not or cannot develop the data.

b) Alterations developed by a TCH

Alterations developed by a TCH may affect fatigue critical structure. The TCH should provide DT data for their alterations by December 18, 2009 in order to support operator compliance with the AASFR. The AAWG recommends that a standardized screening process for alteration SBs should be developed to identify which alteration SBs are affected by the AASFR.

c) Individual Alterations to fatigue critical structure

Individual alterations to fatigue critical structure are typically smaller in size, and the interaction effects are similar to those for a repair. An example of such an alteration may be an antenna that was installed and subsequently removed by a previous operator, but the structural reinforcement doubler was retained or a doubler similar to an SRM repair was installed. Such an alteration may have also been accomplished without issuing a formal STC or the records may be incomplete or missing. This scenario is most likely to occur on older, pre-amendment 45 airplanes and on alterations which were developed prior to the Changed Product Rule (14 CFR 21.101).

With respect to these type individual alterations to fatigue critical structures, the AAWG proposes to address them in the same manner as repairs for that model airplane. Therefore, they should be identified, assessed and categorized using the process given in the model-specific Compliance Document for repairs.

Figure 3.1 – Recommended Actions for Developing DT Data for STCs

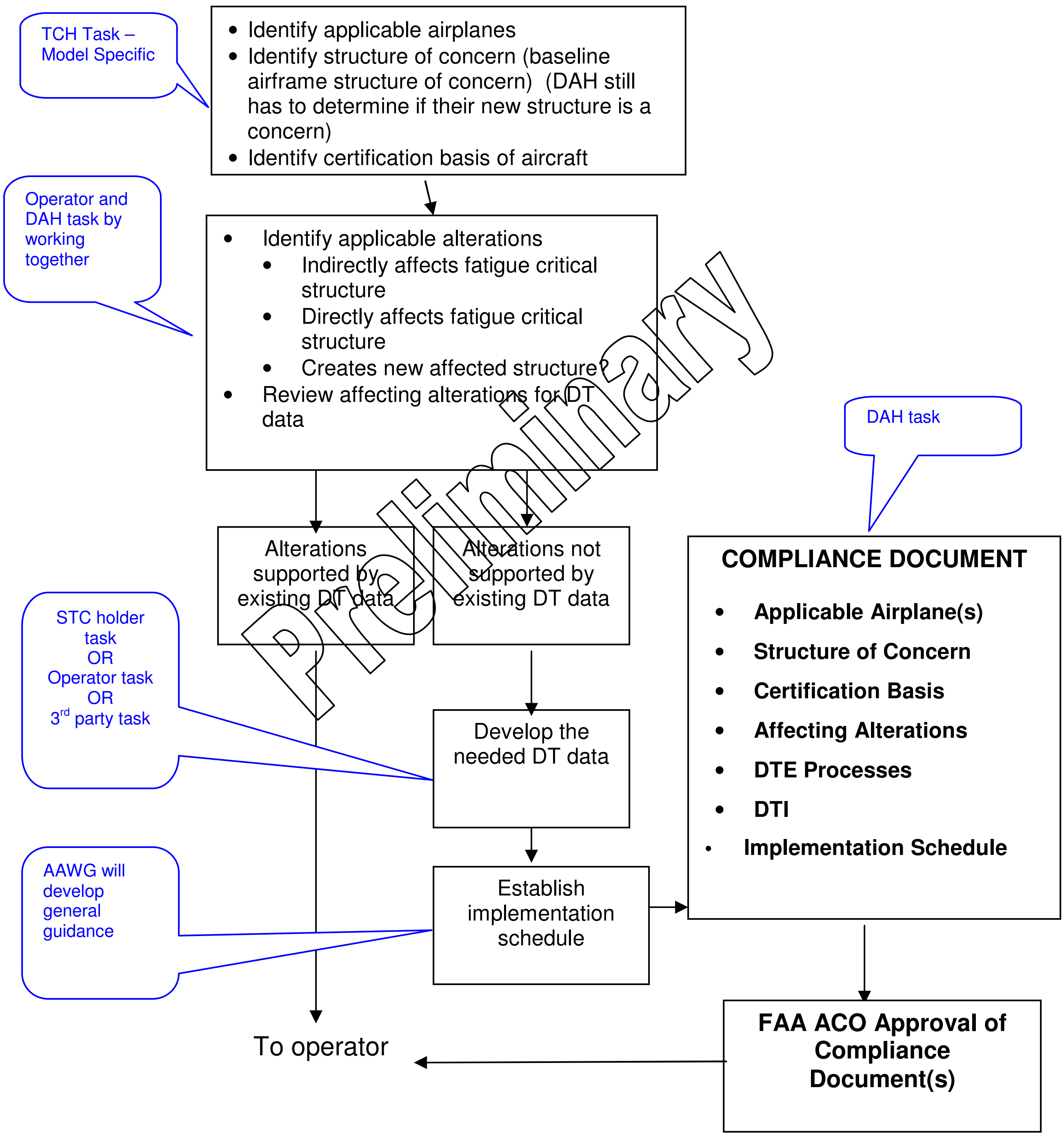
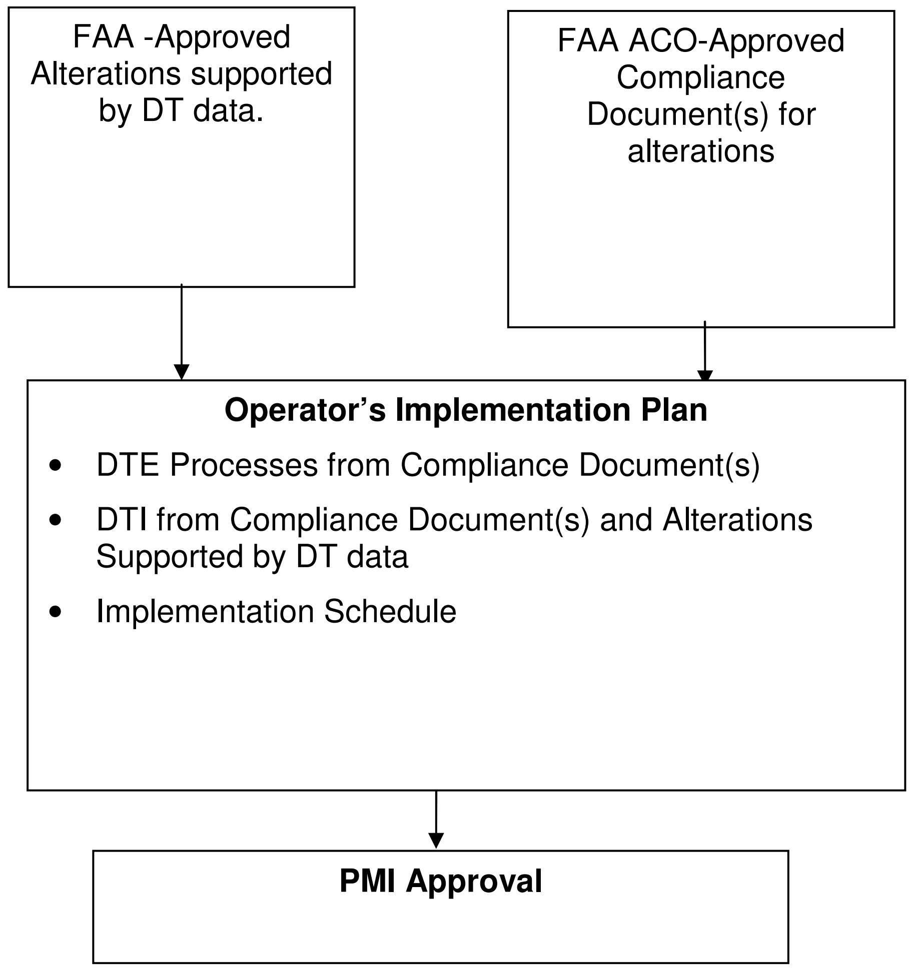


Figure 3.2 - Recommended Operator Action to Incorporate DT Data



B. Task 2 - Element 2 – Evaluation of Task 1 Recommendations on Repairs to Alterations

The AAWG was asked to review and comment on the following:

The report should also provide a recommendation on the means of compliance provided by the AC developed in Task 1 in regards to repairs installed on STC or ATC approved alterations and modifications.

This task element is interpreted by the AAWG to mean:

- Document the means of compliance developed for repairs to alterations in Task1.
- Determine if that means of compliance is applicable to alterations
- Document the AAWG's expectations for the STC DAHs.
- Propose changes to the AC as required.

The proposed AC 120-AAWG is intended to address all repairs to aircraft, including repairs to alterations and modifications. The proposed AC recommends that the DAH for the alteration develop a Compliance Document for repairs to the altered structure; the guidance is contained in Chapter 2 of the AC. The Compliance Document for repairs to the altered structure should contain:

- The applicability (airplane model(s), model variations, or serial numbers) of the alteration.
- An identification of fatigue critical structure that is unique to the alteration.
- The 14 CFR 25.571 certification level to be used.
- A review of existing DT data, if any.
- Development of additional DT data to support compliance. This could either take the form of RAGs or instructions to perform DTE on a case-by-case basis.
- An implementation schedule to bring existing repairs up to DT standards.
- FAA ACO approval of the Compliance Document for the alteration (by the FAA ACO having cognizance over the DAH).

The AAWG believes that the proposed AC 120-AAWG contains sufficient guidance for DAHs of alterations to develop a Compliance Document which would support operator compliance with the AASFR for repairs. As stated in Element 1 of Task 2, the STGs should identify DAHs that hold STC data that are of general interest to a Model Specific STG. The AAWG expects DAHs of such STCs to participate in the STG process and to advise the STG of the status of DT data, both for the STC itself and for repairs to the STC fatigue critical structure. The FAA has publicly noticed (Reference (3.h)) the fact that they are considering the issuing a rule to require DAHs to make available the necessary DT data in a timely fashion, to support operator compliance with the AASFR.

C. Task 2 - Element 3 – Evaluation of the Effectiveness of AC 91-56B for Alterations

The AAWG was requested to review the Draft AC 91-56B and assess its ability to provide the necessary guidance for an entity that is seeking compliance to 14 CFR 121.370a/129.16. In Task 2, the Tasking requests ARAC to do the following for alterations and modifications:

The ARAC should assess the effectiveness of AC 91–56B to provide guidance to STC holders for developing damage-tolerance-based inspections and procedures for alterations and modifications. The ARAC should do the following:

- ***Assess the effectiveness of AC 91– 56B to support Industry compliance with the AASIFR with respect to alterations and modifications.***
- ***Document any improvements to the AC that would provide better direction with respect to the guidance for STC holders in their development of damage-tolerance-based inspections and procedures for alterations and modifications.***

In Task 1, the ARAC was also requested to assess the effectiveness of AC 91-56B to provide guidance for an STC holder in seeking compliance with 14 CFR 121.370a/129.16 for repairs, and provide recommended changes. As stated in Section 3.B.1) of this Report where the topic for repairs was discussed, the overall findings and recommendations were the same for both alterations and modifications.

1) Discussion of Findings

In its review of Draft AC 91-56B, the AAWG made a determination that the guidance provided did not provide adequate directions for an entity seeking compliance to 14 CFR 121.370a/129.16. The changes incorporated into Draft AC 91-56B did not address a variety of technical and programmatic issues that an entity would need to address for compliance to the rule. The results of trying to follow the Draft AC would most likely resulted in a varying degree of compliance throughout the industry. In addition, there were significant differences between the Draft AC and the new FAA tasking contained in Federal Register Document 04-10816, dated 05-13-04. While the AAWG determined that Draft AC 91-56B would not be effective, it did view AC 91-56 as a top-level roadmap to the aging airplane programs that briefly describes the various programs and points to other ACs that provide specific guidance for each of the respective aging airplane programs. Therefore, in response to this the AAWG has developed a Draft AC 120-AAWG that provides guidance to both the DAH and the operator on an acceptable means of compliance to 14 CFR 121.370a/129.16.

2) Discussion of Proposed Changes to Draft AC 91-56B

On the basis of the above findings for Task 2, the AAWG also recommended changes to AC 91-56B with respect to alterations and modifications. These changes associated with Task 2 were included in Section 3.B.1) and Appendix C of this Report to avoid duplication or confusion.

D. Task 2 - Element 4 – Action Plan

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.

1) Action Plan: Task 2 Guidance Material

a) The AAWG will prepare and submit guidance materials for consideration of alterations and modifications to the TAEIG within six months of TAEIG acceptance of the written report.

b) Upon TAEIG acceptance of the AAWG guidance material, the AAWG will recommend that Model Specific STGs invite STC DAH and involve them in the dialog to ensure that DT data is in existence on December 18, 2009 for all commonly embodied STCs.

2) Action Plan: Proposed Schedule for Completion of Guidance Material

a) AAWG complete Task 2 report and submit to TAEIG by December, 2005

b) The TCH will form Model Specific STGs where there is a significant need (e.g. Airplanes certified prior to 14 CFR 25, Amdt 54) by January 2006 to address Task 4 and begin the development of Model Specific Compliance Documents.

c) AAWG will review the Task 2 report recommendations and complete action with appropriate AC 120-AAWG changes within six months of TAEIG Task 2 report acceptance.

d) AAWG will submit the amended guidance material for TAEIG approval at the next scheduled TAEIG meeting.

e) Following TAEIG Acceptance of the guidance material and at the next meeting of the STG, the STGs should identify specific STC DAHs that hold STCs on the Model under consideration.

f) TCH, working with their STGs will identify a list of fatigue critical structure ASAP.

g) The FAA is considering the publication of Subpart I with requirements for STC DAHs to provide DT data. Based on the EAPAS NPRM it is anticipated that Subpart I will require the submittal of a compliance plan by the DAH. That compliance plan will require a time schedule of activities to insure that the required data is supplied on time.

h) According to the FAA Schedule for Subpart I, STC DAHs will be required to submit the compliance plan within 90 days of the effective date of the final rule. At this point it will be apparent which STC DAHs will be providing DT data for the STCs they own.

i) DAHs should complete DT data for STCs, ATCs, SBs, etc. by December 2009. This date may change dependant upon the FAA's rulemaking for a Part 25 rule to require DT data.

j) Operators to incorporate DT data for STCs, ATCs, SBs, etc. by December 20, 2010, if available

k) Operators to submit plan to obtain FAA approved DT data for STCs, ATCs, SBs, etc. which have no DT data to cognizant PMI as part of the implementation plan submitted for compliance to 14 CFR 121.370a/129.16.

4. Task 3 – WFD Considerations for RAMs

A. AAWG Position Regarding the Assessment of WFD for Repairs, Alterations and Modifications:

The analysis of a RAM for WFD provides additional needed information concerning the maintenance program requirements to maintain the continued airworthiness of the airplane. Specifically it will either validate the inspection program established for fatigue related cracking or it would provide inspections that are more stringent and/or establish a removal limit for the RAM.

As part of a WFD evaluation, it was determined that the following two categories of RAMs should be addressed: RAMs susceptible to WFD; and RAMs to areas where the baseline structure is susceptible to WFD. For the latter category, a WFD evaluation is carried out for the baseline structure to establish the appropriate maintenance actions. A RAM in this area may have a repercussion on these maintenance actions. For instance, an STC may affect the stress level on a lap joint, and invalidate the maintenance actions that have been defined to preclude WFD in this lap joint. Therefore, WFD actions for baseline structure should be defined prior to requiring an assessment of the effect of the RAM.

B. Task 3 - Element 1 – Recommendations for WFD of RAMs

The AAWG was asked to consider the following in regards to WFD of RAMs:

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.

1) 2001 ARAC Recommendations Regarding WFD

In May 2001, ARAC recommended (See Reference (3.b)) that large transport category airplanes have new operational rules enacted that would assure that fatigue cracking that could lead to a WFD condition would be detected and corrected in a timely fashion. Two operating requirements were proposed by ARAC for each operational rule part. The first established a “Limit of Validity” of the maintenance program and the second established a requirement for structural maintenance programs that considered the aspect of preventing WFD in the fleet. In the near future, it is expected that the FAA will release these operational rules with some modifications based on the requirements of the AASFR and other rules that are currently being considered.

Appendix C contains a copy of the NPRM submitted by ARAC on the subject of WFD. For the purposes of reference, the following is a synopsis of the intent of the proposed operational rules.

<u>Operational Rule 1 – Basis of Structural Maintenance Program</u>

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.

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. <u>Acceptable mandatory modifications programs</u> 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. <u>An acceptable CPCP</u> 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 Final 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.

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 DAH.

Second, 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.*

2) Discussion of ARAC Recommendations

The ARAC recommendations for prevention of WFD were developed using the concept of a stand-alone audit of the baseline structure and any repairs, alterations and modifications that might have been performed. With the advent of the Aging Airplane Safety Final Rule in February 2005, the ARAC recommendations, while still being valid, need some reconsideration from both a technical and a managerial point of view. In addition, airplanes certified to later amendment levels of 14 CFR 25 may meet the WFD requirements during certification. With this in mind, the AAWG would like to extend and adjust the 2001 recommendations accordingly.

The 2001 ARAC recommendations stipulated a rather elaborate operator based means to develop and incorporate inspections into maintenance programs for WFD considerations for RAMs. The AAWG has reviewed this means and has determined that the AASFR provides a more convenient means of accomplishing the development of maintenance programs for RAMs that will preclude the development of WFD.

Specifically the determination of any maintenance actions required to preclude WFD should be done in context of the procedure established in the AC for determination of the damage tolerance requirements for the RAM. Such requirements are determined during Stage 3 of the review process for repairs. This is a natural place to determine all future maintenance requirements for the RAM including WFD. In the context of the AC, this procedure supports both new and existing RAMs.

For new RAMs, additional work is required on the part of the DAH. The DAH should consider updating any significant published documents like the SRM, RAP and or Structurally Significant Service Bulletins to include information relative to maintenance requirements for WFD.

Finally, the 2001 ARAC recommendations also recommended the establishment of a Limit of Validity (LOV). This LOV establishes a point in the operational life of the airplane where the maintenance program as contained in the ICA of the airplane for continued airworthiness is no longer supported by existing OEM engineering data. The ARAC recommends that operation of the airplane be halted at this point until new engineering data is developed to support the continued airworthiness. The LOV is applicable to both the baseline structure and any RAMs that may have been embodied.

a) 2005 AAWG Recommendations on WFD

The AAWG was specifically tasked to consider how best to assess the WFD characteristics of RAMs on the continued airworthiness of airplanes with a maximum gross takeoff weight of greater than 75,000 pounds. This includes all large transport category airplanes in service today.

The AAWG's original recommendations came with guidance information that allowed operation of the airplane up to DSG before a WFD assessment of the baseline structure was required for the airplane. This recommendation was written primarily for airplanes certified to 14 CFR Amendment 45 and earlier yet the AAWG believes that this is also appropriate for all post amendment 45 airplanes where a two-lifetime fatigue test was performed. The question is when is it appropriate to assess RAMs for WFD. The AAWG considered this question and determined that in all cases, assessment of a RAM for WFD should be done after the assessment of the baseline structure especially if the RAM was evaluated for Damage Tolerance and is under a continued airworthiness program. With respect to WFD for RAMs, the AAWG believes the following to be an appropriate program to enact:

- For those airplanes that need a survey to address DT for repairs, the WFD assessment should occur at the same timeframe (action and implementation plan)
- For newer airplanes that only need WFD for repairs (e.g. 14 CFR Part 25 Amdt. 54 and beyond), the WFD action should occur when the airplane reaches DSG
- For newer airplanes that only require WFD for alterations (e.g. 14 CFR Part 25 Amdt. 96 and beyond) the WFD action should occur at RAM certification

Further, the 2001 Recommendations failed to establish a means to implement the program. While all of the requirements were there, the mechanics of what needed to be done was lacking. Therefore, the AAWG believes that the following is appropriate to insure the timely handling of the WFD issues for both the baseline structure and any embodied RAMs. The actions discussed below should be in place and scheduled for completion for all affected airplanes by December 2010.

The AAWG envisions that the requirement will be addressed through the submittal of a plan by December 2009 that delineates the following DAH actions as developed within the STG activities:

i. Definition of the LOV for All Large Transport Category Airplanes with Maximum Gross Takeoff Weights greater than 75,000 pounds.

(1) DSG, or

(2) Other limit with rationale and/or a list of required actions (existing or underdevelopment)

ii. A schedule, dependent on 14 CFR 25 Certification Amendment as discussed above, for completion of the following:

(1) A review of Published Service Information (SRMs, SBs, Service Letters, etc.) with-respect-to WFD and propose service action to achieve the initial LOV, if required.

(2) Guidelines for determining which repairs and alterations need to be assessed for WFD.

(3) Model specific implementation program, including:

(a) Timeframe and actions required for when to review repairs and RAMs for WFD.

(b) - STCs/ATCs are assessed for WFD (includes Baseline Structure of the STC/ATC and surrounding fatigue critical structure).

iii. Expected Timeframe for action would be in accordance with the 14 CFR 25 Amendment Level of the airplane under consideration as Depicted in the Table 4.1.

TABLE 4.1 – WFD REQUIREMENT BY CERTIFICATION LEVEL

	14 CFR 25 / 25.571 Applicable Amendment			
ISSUE	**Pre Amdt 45**	**Amdt 45**	**Amdt 54 to 86**	**Amdt 96**
Establishment of LOV	Dec 2009	Dec 2009	Dec 2009	Dec 2009
WFD Baseline	121.WFD	121.WFD	121.WFD	T.C.
DT RAMs-AASFR	Survey*	Survey* & T.C.	Survey* and/or T.C.**	T.C.
WFD RAMs	Concurrent with DT Survey*	Concurrent with DT Survey*	Survey Similar to one like the DT req.	T.C.

* Survey means Survey conducted per the AASFR Implementation Plan
** STG will decide if Survey is necessary

> Note: Once the Limit of Validity is reached, the airplane can no longer be operated unless that original Limit of Validity is extended with appropriate new service actions.

This plan would be submitted to the ACO for approval.

The Table 4.2 further explains when a repair or alteration would receive an assessment for WFD. The information contained in this chart is preliminary and subject to further discussion and may differ in the final proposal developed in the Task 3 follow-on activity.

TABLE 4.2 – PROPOSED TIMELINE FOR DEVELOPING DT AND WFD MAINTENANCE REQUIREMENTS

Timelines for Obtaining DT and WFD Assessments for Repairs and Alterations				
		REPAIRS	**ALTERATIONS**	
DT	**Existing**	75% DSG*	By Dec 18, 2009 (if DAH support) OR plan in place to get data or other action within 4 yrs from Dec 18, 2009 (if no DAH support)	
	New	3 stage**	New cert. new instl	DT required prior to certification today (Recommendation)
			Old cert. new instl	DT required on all installations after Dec 20, 2010
WFD	**Existing**	75% DSG*	By Dec 18, 2009 (if DAH support) OR plan in place to get data or other action within 4 yrs from Dec 18, 2009 (if no DAH support)***	
	New Cert prior to Amend 45	3 Stage** Accomplished at time of DT assessment clear repair to operational limit	3 stage** Accomplished at time of DT assessment clear alteration to operational limit	
	New Cert Amend 45 to 95	At DSG 3 Stage **	At DSG 3 Stage ** Operators concerned that this may require a tracking or survey of their airplanes at DSG Airbus concerned that the requirement for WFD does not exist for these airplanes and that the baseline structure has not yet been evaluated for WFD, why consider repairs and alterations	
	New Cert At Amend 96 and Above	3 Stage** Accomplished at time of DT assessment clear repair to operational limit	3 Stage** Accomplished at time of DT assessment clear alteration to operational limit	

*75% DSG really means ….. Stage 1 @ 75% DSG
Stage 2 within 12 months from stage 1
Stage 3 just prior to (I)
Refer to App. 5 for details

**3 stage means what App. 4 says…. Stage 1 @ time of installation
Stage 2 within 12 months (DT, not WFD?)
Stage 3 just prior to (I), included DT & WFD

*** Requirement is to identify any maintenance actions required for WFD to DSG or LOV

b) Technical Considerations

The AAWG still supports the technical recommendations given to ARAC and the FAA in May 2001. This includes the establishment of a Basis for the Structure Maintenance Program and a definition of a "Limit of Validity" (LOV) or equivalent. The AAWG also supports a timely audit of the baseline structure and any repairs, alterations and modifications to define any required changes or additions to the structural maintenance program to preclude the occurrence of WFD.

While ARAC spent a considerable amount of time developing and confirming the WFD methodology for the baseline structure, comparably little time was spent on how that methodology would perform on repairs, alterations and modifications. It is now apparent that some further technical considerations with appropriate guidance need to be developed to prevent development of WFD in RAMs.

To facilitate the development of the data necessary for compliance to the rule, the following needs to be established:

i. Repair configurations that are susceptible to WFD
    (1) Size effect
        e.g. large doubler repairs (bigger than 1 frame bay two stringer bays)
    (2) Multiple site
        Repairs at the same location at multiple parts (e.g. stringers at the same frame station)
    (3) Interaction of different repairs
        Blend out near a doubler repair (stress increase due to two different reasons)

ii. Development of maintenance program parameters.

A major difference between RAMs and baseline structure is the level of associated test evidence. Whereas the baseline structure is almost fully represented in full-scale tests, RAMs may only be installed in selected areas. As a result, RAMs are typically justified by analysis methods that have been proven by tests rather than tests themselves. Guidance material is needed on how to adjust the factors associated to the determination of the Inspection Start Point (ISP) and the Structural Modification Point (SMP) to account for the lack of test evidence.

Further, a number of methods of analysis proposed for WFD account for the number of airplanes in the fleet in the determination of ISP and SMP. RAMs on the other hand may be unique to one airplane, or a limited number of airplanes making the use of fleet data difficult. Further the time those RAMs were embodied on an airplane would vary and their respective lives would likewise be difficult to characterize. Guidance is needed on how to appropriately handle such situations.

c) Program Management Considerations

i. Both new and existing RAMs should be assessed for WFD in the same time stipulated in the AC for DT. This means the three stage approach:

(1) Stage 1 – Clearance for Static Strength and return to flight
(2) Stage 2 – Within twelve months the establishment of a threshold for inspections
(3) Stage 3 – Twenty-four months before the threshold development of inspections and/or replacement times to maintain continued airworthiness when fatigue cracking is likely. Stage 3 contains consideration for development of WFD.

ii. Existing DAH documents, like the SRM and RAP, should be updated to include consideration for WFD damage scenarios by December 18, 2009 to support compliance to 121.WFD where operation past DSG is defined.

iii. The entities that are responsible for the development of data to support the three stage approach is as follows:

(1) Baseline structure to be supported by the OEM
(2) STCs to be supported by the STC holder
(3) RAMs done by a DAH to be supported by the DAH
(4) Where the DAH or STC holder no longer is in a position to support the development of the data, the certificate holder is responsible for the development.
(5) The time WFD should be assessed: Guidance should be developed that specify that WFD inspections should be incorporated into the maintenance planning beyond DSG at the threshold determined in Stage 2.

C. AAWG Recommendations

1) WFD for baseline structure should be accomplished prior to WFD for RAMS
2) With respect to WFD for RAMs
   a) For those airplanes that need a survey to address DT for repairs, the WFD actions should occur at the same timeframe (action and implementation plan)
   b) For those newer airplanes that only need WFD for repairs (e.g. part 54-96), the WFD action should occur at a timeline dependent upon when the airplane reaches DSG
   c) For those newer airplanes that only require WFD for alterations (e.g. Amdt. 54-96) the WFD action should occur at DSO.

3) Both new and existing RAMs should be assessed for WFD in the same time stipulated in the AC for DT. This means the three stage approach:
   a) Stage 1 – Clearance for static strength and return to flight
   b) Stage 2 – Within twelve months the establishment of a threshold for inspections
   c) Stage 3 – Twenty-four months before the threshold development of inspections and/or replacement times to maintain continued airworthiness when fatigue cracking is likely. Stage 3 contains consideration for development of WFD.

4) Existing DAH documents, like the SRM and RAP, should be updated to include consideration for WFD damage scenarios by December 18, 2009 to support compliance to 121.WFD where operation past DSG is defined.

5) The entities that are responsible for the development of data to support the three stage approach is as follows:
   a) Baseline structure to be supported by the OEM
   b) STCs to be supported by the STC holder
   c) RAMs done by a DAH to be supported by the DAH
   d) Where the DAH or STC holder no longer is in a position to support the development of the data, the certificate holder is responsible for the development.

   To facilitate the development of the data necessary for compliance to the rule, the following should be established:

   e) Repair configurations that are susceptible to WFD
      i. Size effect
         e.g. large doubler repairs (bigger than 1 frame bay two stringer bays)
      ii. Multiple site

Repairs at the same location at multiple parts (e.g. stringers at the same frame station)

iii. Interaction of different repairs
Blend out near a doubler repair (stress increase due to two different reasons)

6) Development of WFD data.

A major difference between RAMs and baseline structure is the level of associated test evidence. Whereas the baseline structure is almost fully represented in full-scale tests, RAMs may only be installed in selected areas. As a result, RAMs are typically justified with analysis methods that have been proven by tests rather than tests themselves. Guidance material is needed on how to adjust the factors associated to the determination of ISP and SMP to account for the lack of test evidence.

Further, a number of methods of analysis proposed for WFD take into account the number of airplanes in the fleet in the determination of ISP and SMP because the details under examination exist on every airplane in that fleet. RAMs on the other hand may be unique to one airplane or a limited number of airplanes and may have significantly different lives than the airplanes themselves. Guidance is needed on how to appropriately handle such situations.

7) The time WFD should be assessed:

Guidance should be developed to specify that WFD inspections should be incorporated into the maintenance planning beyond DSG at the threshold determined in Stage 2.

D. Task 3 - Element 2 – WFD Action Plan

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.

1) Action Plan: Task 3 Guidance Material

Upon acceptance by ARAC of the recommendations above, the AAWG will establish a group of technical experts that will develop the required technical basis for the guidance material. They will then develop that material for inclusion in either FAA Advisory Circular 120-AAWG or another, yet to be determined, AC.

It is important that the guidance material will enable the STGs and individual operators to develop the required data to support operator compliance. The following is appropriate to consider when looking at both the guidance material and the operation of the STGs.

a) Screening process to identify significant STCs. The guidance material should contain a means to screen STCs to determine which ones would be of a potential concern for development of WFD.
b) Developing means to acquire data for significant STCs where the DAHs are not in a position to supply the data. There will be some STCs where the DAH is unavailable to develop the data. The STG should develop a plan whereby the data is developed.
c) There may be other actions that could be considered to assist the operators in developing the data.

2) Action Plan: Proposed Schedule for Completion of Guidance Material

The AAWG will complete this additional work within six months of the acceptance of the recommendations by ARAC.

A key element of the schedule is the inclusion of an invitation to significant STC holders to participate in the STG. An invitation should be extended to those DAHs who hold the certification data for STCs identified in step one. Their participation in the STG will be of great assistance in developing the required data.

5. Task 4 – Model Specific Programs

The DAH should complete the framework of a Compliance Document by December 20, 2008 for each affected model and that document should include the identification of fatigue critical structure and the means by which repairs are to be addressed (both existing and future repairs). This document will have within it the methods to be employed in the assessment but may not contain some of the required data such as updates to the SRM and any model specific RAGs. The SRM updates and any model specific RAG documents should be published by December 18, 2009. Once the SRM updates and any RAG documents are published and referenced in the Compliance Document, this document will be presented to the FAA ACO for approval. Following approval, the Compliance Document will form the basis for certificate holder compliance for repairs to the as delivered OEM structure to 14 CFR 121.370a/129.16.

6. Conclusions and Recommendations

Compliance with the new Aging Airplane Safety Final Rule, 14 CFR 121.370a and 129.16 will require operators and DAHs to cooperatively develop data that, in some cases, does not currently exist. The AAWG recommends that this be accomplished through model specific STGs for both baseline structure as well as for repairs, alterations and modifications. Operators of applicable airplanes must have this data to show compliance by December 20, 2010. To this end, all updates to existing data should be published by December 18, 2009.

Task 1 & 2 Conclusions and Recommendations (Repairs and Alterations/Modifications)

Even though 14 CFR 121.370a and 129.16 could be construed to be applicable to repairs alterations and modifications to composite structure, the AAWG did not specifically develop guidelines for this particular type of structure. There were three principal reasons for this: (1) there is not a significant amount of composite primary structure on airplanes today; (2) most of that structure is on airplanes that were certified to Amendment 45 or later; and (3) the certification process in regards to damage tolerance for composite structure is significantly different than that of metallic structure and are adequately covered by AC 20-107A.

The AAWG developed draft AC 120-AAWG to document the process for assessing repairs to fatigue critical structure. The proposed AC addresses repairs to both baseline structure as well as repairs to alteration and modifications. The AAWG believes that the proposed AC 120-AAWG contains sufficient guidance for DAHs to develop a Compliance Document which would support operator compliance with the AASFR for repairs.

Key to completing this process is the identification of fatigue critical structure for each applicable airplane model. Repairs to the fatigue critical structure will need to be assessed for damage tolerance. Depending on the certification level of the aircraft model and whether installed repairs are already covered by DT data, this may require a survey of the aircraft.

The conclusions and recommendations (***Bold Italicized Text***) from the AAWG tasking regarding repairs and repairs to alterations are documented in Sections 3 through 5 of this report. These are summarized below.

1. SSID programs and ALS were developed to address the un-repaired fatigue critical structure and do not consistently provide instructions for repairs to that structure.

2. The AAWG recommends that existing SBs, SRM, SSID programs and ALS programs for each applicable airplane be reviewed and updated to include DT data for all repairs to fatigue critical baseline structure as well as repairs to alterations and modifications by December 18, 2009.

3. The AAWG concluded that there are repairs and modifications to structural components susceptible to fatigue contained in the AMM and/or CMM and that these repairs and modifications are not under the same level of scrutiny that other repairs are subjected to.

4. The AAWG recommends that the FAA issue additional tasking to the ARAC to investigate the status of the AMM and CMM, and make appropriate recommendations.

5. The AAWG concluded that the development of RAG documents for the fuselage pressure boundary (fuselage skin, door skins, and bulkhead webs) provides vital information for operators to comply with 14 CFR 121.370 and 129.32 for the applicable airplanes.

6. The AAWG recommends that a generalized RAP program (includes greater coverage of fatigue critical structure than the pressurized boundaries) be considered and developed, if technically and economically feasible.

7. For those airplanes certified to Amendment 45 or later, where repairs to the fuselage pressure boundary were not provided with DT data, it is recommended that a Fuselage RAP program be developed in accordance with the guidance provided in AC 120-73, where economically feasible.

8. The AAWG recommends that the TAEIG task the AAWG to revise AC 120-AAWG to include a process for developing damage tolerance based maintenance inspections for alterations and modifications. A copy of the proposed tasking is included in Appendix E of this report.

9. The AAWG reviewed draft AC91-56B and made the determination that the guidance material does not provide adequate directions for an entity seeking compliance to AASFR.

10.The AAWG recommends that AC 91-56B be revised as delineated in Sections 2 and 3 of this report. A full draft of a proposed revision of AC 91-56B is included in Appendix C.

11. The AAWG reviewed AC 25.1529-1 and determined that the guidance material would not support compliance to the AASFR and further did not follow industry-accepted practice.

12. The AAWG recommends that AC 25.1529-1 be cancelled and incorporated in pertinent part into the proposed AC 120-AAWG.

13. The AAWG Recommends that AC 120-AAWG be promulgated as a means of compliance to 14 CFR 121.370a and 129.16 with respect to repairs. A copy of this AC is contained in Appendix B.

Task 3 Conclusions and Recommendations (WFD for RAMs)

14. For WFD evaluation, the AAWG concluded that the following two situations should be addressed:

a. The structural configuration of the RAM itself, if it is susceptible to WFD;

b. The effect of the RAM on baseline structure susceptible to WFD.

15. WFD actions for baseline structure should be defined prior to requiring an assessment of the effect of the RAM.

16. The determination of any maintenance actions required to preclude WFD should be done in context with the procedure defined in AC 120-AAWG for determination of the damage tolerance requirements for the RAM:

a. For those airplanes that need a survey to address DT for repairs, the WFD assessment should occur within the same timeframe (action and implementation plan;

b. For newer airplanes that will require WFD analysis for repairs and alterations, (e.g. 14 CFR Part 25 Amdt. 54 and beyond), the WFD action should occur when the airplane reaches DSG

c. For newer airplanes that only require WFD for alterations (e.g. 14 CFR Part 25 Amdt. 96 and beyond) the WFD action should occur at certification

17. Existing DAH documents, like the SRM and RAP, should be updated, in a timely fashion, to include consideration for WFD damage scenarios to support compliance to 121.WFD, where operation past DSG is defined.

18. To complete Task 3, the AAWG recommends that the TAEIG task the AAWG to assemble a group of technical experts for the development of the required technical basis on how to address WFD for RAMs. The work product of this activity would be material for inclusion in either FAA Advisory Circular 120-AAWG or yet another, to be determined, AC. A copy of the proposed Tasking is included in Appendix E of this report.

<u>Task 4 Conclusions and Recommendations (Model Specific Programs)</u>

19. The AAWG concurs with the ARAC Tasking in that it should oversee the timely development and implementation of model specific Compliance Documents and new and updated model specific data to support operator compliance.

20. The AAWG concurs that model specific STGs should be formed to identify the fatigue critical structure, and review existing data that could be used in support of compliance with the AASFR and that the AAWG oversee that activity.

21. The AAWG concluded that the cooperation of the Type Certificate Holders and the Design Approval Holders is necessary for operators to be able to comply with the AASFR.

22. The AAWG recommends that the DAH Model Specific Compliance Document, as delineated in AC 120-AAWG, be published by December 20, 2008, and the new and updated model specific data to support operator compliance be published by December 18, 2009. In addition, the AAWG recommends that the AAWG oversee the development of this data as delineated in Appendix E.

Appendix A: Copy of FAA Tasking Notice

Federal Register / Vol. 69, No. 93 / Thursday, May 13, 2004 / Notices

Pages 26641 through 26644

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

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

AGENCY: Federal Aviation Administration (FAA), DOT.

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

SUMMARY: The FAA assigned the Aviation Rulemaking Advisory Committee a new task to develop guidance that will support industry compliance with the Aging Airplane Safety Final Rule requirements that relate to supplemental structural inspections. This new tasking will also address certain aspects of recommendations made during a previous ARAC tasking related to widespread fatigue damage. This notice is to inform the public of this ARAC activity.

FOR FURTHER INFORMATION CONTACT: Mike Kaszycki, Federal Aviation Administration, Transport Standards Staff, 1601 Lind Avenue, SW., Renton, Washington 98055–4056, _mike.kaszycki@faa.gov._

SUPPLEMENTARY INFORMATION:

Background

The FAA established the Aviation Rulemaking Advisory Committee to provide advice and recommendations to the FAA Administrator on the FAA's rulemaking activities with respect to aviation-related issues. This includes obtaining advice and recommendations on the FAA's commitments to harmonize Title 14 of the Code of Federal Regulations (14 CFR) with its partners in Europe and Canada.

Airplane Applicability of Tasking

This new tasking shall apply to transport category airplanes with a type certificated passenger seating capacity of 30 or greater, or a maximum payload capacity of 7,500 pounds or greater, operated under part 121 or under part 129 (U.S. registered airplanes).

Statement of Tasking

There are four major tasks to be completed under this tasking:

Task 1.—Repairs to Baseline Primary Structure and Repairs to Alterations and Modifications

Draft an Advisory Circular (AC) that contains guidance to support the following two paths of compliance with §§ 121.370a and 129.16 of the Aging Airplane Safety Interim Final Rule (AASIFR):

1. *Damage-tolerance-based inspection program developed by part 121 and 129 certificate holders:* Develop guidelines and procedures that will enable part 121 and 129 certificate holders to develop a damage-tolerance-based inspection program that addresses repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

2. *Model specific damage-tolerance-based inspection program:* Develop Guidance that can be used by Type Certificate (TC) holders, Supplemental Type Certificate (STC) holders, and Structural Task Groups to support the development of a model specific damage-tolerance-based inspection program. The model specific damage-tolerance-based inspection program will address repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The developed model specific inspection program will support part 121 and 129 certificate holders' compliance with the AASIFR.

A written report will also be submitted that includes an action plan for the implementation of the recommendations of task 1 that will be addressed in task 4 below. The report is to be submitted to the Aviation Rulemaking Advisory Committee (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.

In the process of drafting the AC, the ARAC should assess the effectiveness of AC 91–56B to provide guidance to TC and STC holders for developing damage-tolerance-based inspections and procedures for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The ARAC should do the following:

• Assess the effectiveness of AC 91– 56B to support Industry compliance with the AASIFR with respect to repairs.

• Document any improvements to the AC that would provide better direction with respect to the guidance for TC and STC holders in their development of damage-tolerance-based inspections and procedures for repairs.

The ARAC is requested to validate that the guidance material in the new AC will result in programs that provide a high degree of autonomy for part 121 and 129 certificate holders while supporting compliance with the AASIFR. In order to determine a rational approach for addressing repairs to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, and are not currently covered by a mandated program, the AC should provide guidance to the part 121 and 129 certificate holders and to the type certificate holder to address the seven issues listed below.

1. The significance of the airplane certification amendment level in providing direction for the development of damage tolerance inspections and methods for repairs.

2. The degree to which Supplemental Structural Inspection Documents/ Programs (SSID/P) or equivalent documents/programs provide direction to repair the structure using damage-tolerance-rated repairs. The assessment should apply to SSID/Ps or equivalent documents/programs developed for 14 CFR part 25 pre-amendment 25–45 transport airplane models having a maximum gross takeoff weight of 75,000 lbs or greater. The following should be identified:

• Areas of aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by SSID/ Ps or equivalent documents/programs

• Significant assumptions applied in developing SSID/Ps or equivalent documents/programs

• Any significant issues in the implementation of the requirements of SSID/Ps or equivalent documents/ programs

• Data from SSID/Ps or equivalent documents/programs that would be useful in supporting this new tasking

3. The degree to which an applicable airplane model's Airworthiness Limitations Section (ALS) provides direction to repair the structure using damage-tolerance-rated repairs. This assessment should apply to damage-tolerance-based inspection programs/ data developed for 14 CFR part 25 amendment 25–45 or later transport airplane models having a maximum gross takeoff weight of 75,000 lbs or greater. The following should be identified:

• Areas of aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by a damage-tolerance-based inspection program/data

• Any significant issues in the implementation of the requirements of the damage-tolerance-based inspection programs/data

• Data from the damage-tolerance-based inspection programs that would be useful in supporting this new tasking

4. The degree to which existing Repair Assessment Guideline documents developed for §§ 121.370 and 129.32 provide damage-tolerance-based inspections for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The assessment should identify the following:

• Areas of the aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by these documents

• Data from these documents that would be useful in supporting this new tasking

5. Identify the issues/difficulties industry has encountered with establishing damage-tolerance-based inspections and procedures for repairs as required by various FAA approaches in issuing SSIP airworthiness directives (*e.g.*, 727/737 AD 98–11–03 R1,

AD 98– 11–04 R1 verses other SSIP AD approaches like the 747). The assessment should identify the following:

• Comparison of approaches with pros and cons for each approach

• Data from these documents that would be useful in supporting this new tasking

6. Assess the extent to which Structural Repair Manuals (SRM) provide damage-tolerance-based inspections for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

7. Assess the need to include damage-tolerance-based inspections and procedures in TC and STC Holder issued Service Bulletins (SB) that provide repair instructions for aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

Task 2.—Alterations and Modifications to Baseline Primary Structure, Including STCs and Amended Type Certificates (ATCs)

Prepare a written report assessing how an operator would include damage tolerance-based inspections and procedures for alterations and modifications made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. This assessment would include, but is not limited to, alterations and modifications performed under an STC, ATC, FAA field approval (*e.g.*, FAA form 337) and/or FAA approved TC holder design data. The report should include a recommendation on the best means to develop damage-tolerance-based inspections and procedures for these alterations and modifications and the applicability of AC 91–56B. The ARAC should assess the effectiveness of AC 91–56B to provide guidance to STC holders for developing damage-tolerance-based inspections and procedures for alterations and modifications. The ARAC should do the following:

• Assess the effectiveness of AC 91– 56B to support Industry compliance with the AASIFR with respect to alterations and modifications.

• Document any improvements to the AC that would provide better direction with respect to the guidance for STC holders in their development of damage-tolerance-based inspections and procedures for alterations and modifications.

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 should also provide a recommendation on the means of compliance provided by the AC developed in Task 1 in regards to repairs installed on STC or ATC approved alterations and modifications. 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 (FAA concurrence is necessary to ensure actions will support industry compliance with the AASIFR).

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.

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 the 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.

Schedule

The tasking will be performed in two phases. In Phase 1, the ARAC will provide to the FAA the results of Tasks 1 through 3. Phase 1 should be accomplished by December 16, 2005. In Phase 2, the Structures Task Groups, under the direction of the ARAC, should produce the model specific guidance material, Task 4, using the guidelines and procedures of the AC produced in Phase 1. The ARAC will be responsible for coordinating and overseeing the STG's application of the AC. Phase 2 documents should be completed by December 18, 2009.

ARAC Acceptance of Task

ARAC accepted the task and assigned the task to the Airworthiness Assurance Working Group, Transport Airplane and Engine Issues. The Structural Task Groups (STG) composed of type certificate and part 121 and 129 certificate holders familiar with the specific model aircraft will support the working group. The working group will serve as staff to ARAC and assist in the analysis of the assigned task. ARAC must review and approve the working group's recommendations. If ARAC accepts the working group's recommendations, it will forward them to the FAA.

Working Group Activity

The Airworthiness Assurance Working Group must comply with the procedures adopted

by ARAC. As part of the procedures, the working group must:

1. Recommend a work plan for completion of the task, including the rationale supporting such a plan for consideration at the next meeting of the ARAC on transport airplane and engine issues held following publication of this notice.

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

3. Draft the appropriate documents and required analyses and/or any other related materials or documents.

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

Participation in the Working Group

The Airworthiness Assurance Working Group will be composed of technical experts having an interest in the assigned task. A working group member need not be a representative or a member of the full committee. If you have expertise in the subject matter and wish to become a member of the working group you should write to the person listed under the caption **FOR FURTHER INFORMATION CONTACT** expressing that desire, describing your interest in the task, and stating the expertise you would bring to the working group. We must receive your request to participate no later than May 28, 2004. The assistant chair, the assistant executive director, and the working group chair will review your request and will advise you whether your request is approved. If you are chosen for membership on the working group, you must represent your aviation community segment and actively participate in the working group (*e.g.*, attend all meetings, provide written comments when requested to do so, *etc.*). You must also devote the resources necessary to support the working group in meeting any assigned deadlines. You must keep your management chain and those you may represent advised of working group activities and decisions to ensure that the proposed technical solutions don't conflict with your sponsoring organization's position when the subject being negotiated is presented to ARAC for approval.

Once the working group has begun deliberations, members will be added or substituted only with the approval of the assistant chair, the assistant executive director, and the working group chair.

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

Meetings of the ARAC will be open to the public. Meetings of the 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. The FAA will make no public announcement of working group meetings.

Issued in Washington, DC, on May 4, 2004.

Anthony F. Fazio,

Executive Director, Aviation Rulemaking Advisory Committee.

[FR Doc. 04–10816 Filed 5–12–04; 8:45 am]

BILLING CODE 4910–13–P

Appendix B: Draft AC 120-AAWG

ADVISORY CIRCULAR

DAMAGE TOLERANCE INSPECTIONS FOR REPAIRS

TABLE OF CONTENTS

CHAPTER 1. PURPOSE OF THIS ADVISORY CIRCULAR

100. PURPOSE.

a. This Advisory Circular (AC) provides guidance material for design approval holders (DAH) and operators in developing and incorporating Damage Tolerance Inspections and Procedures (DTIP). The AC will support compliance with 14 CFR Parts 121.370a and 129.16, the Aging Airplane Safety Final Rule (AASFR) with respect to repairs. This AC is applicable to repairs to structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. This structure is referred to in this AC as fatigue critical structure.

b. This includes repairs made to the as delivered airplane structural configuration as well as repairs to alterations and modifications. For operators to comply they will need to demonstrate that new and existing repairs will have an evaluation and have DTIP or other procedures implemented if needed. This AC provides guidance for addressing both new and existing repairs.

101. APPLICABILITY.

This AC is applicable to Type Certificate Holders, Supplemental Type Certificate Holders and operators of transport category airplanes with a type certificated passenger seating capacity of 30 or greater, or a maximum payload capacity of 7,500 pounds or greater. The applicability is limited to airplanes operated under Parts 121 or 129 (US Registered Airplanes).

102. DAMAGE TOLERANCE INSPECTIONS AND PROCEDURES, DAMAGE TOLERANCE EVALUATION PROCESSES (DTE PROCESSES) AND DAMAGE TOLERANCE DATA (DT DATA).

a. The term Damage Tolerance Inspections and Procedure used in the AASFR is synonymous with the term Damage Tolerance Data (DT data) used in this AC and described below. These Damage Tolerance Inspections for repairs supplement existing regulator approved maintenance programs including those contained in the instructions for continued airworthiness, scheduled maintenance programs, SSID and ALI programs, Service Bulletins, and Repair Assessment Programs.

b. Amendment 45 to 14 CFR Part 25 introduced the use of damage tolerance principles. This approach requires an evaluation of the structure to determine its crack growth and residual strength characteristics. The evaluation supplies the information necessary to determine a maintenance plan for continued airworthiness. For this AC, the term DTE processes refers to an approved process, that includes, analysis and/or tests and service data, that leads to a determination of a continuing airworthiness maintenance plan, including inspections (i. e. DTI), or other procedures for a repair or replacement of fatigue critical structure. Consistent with the guidance provided by this AC, a DTE process could entail anything from a rigorous analysis methodology for use by a structures analyst to generic guidelines for operator use. This process will enable a survey and assessment of existing repairs to be made. In this AC, DTE processes plus DTI is referred to collectively as DT data.

c. DTE processes typically result in four items that comprise the DTI. Those are as follows:

- Where to inspect.
- When to start inspecting.
- How to inspect.
- How often to repeat the inspection.

d. For some airplane models, the requirements of the AASFR are beyond the scope of the original certification level. For these airplanes, development of DT data and incorporation of that data into the existing maintenance program is required. For other models, there are DT data included in various documents, for example Supplemental Structural Inspection Document/Program (SSID/P), Repair Assessment Guidelines (RAGs), Airworthiness Limitation Sections (ALSs), Structural Repair Manuals (SRMs), and Airworthiness Directives (ADs). Operators may use these DT data in part or in whole to support compliance with the requirements of the AASFR for repairs.

e. Sometimes, the results of the DTE process may indicate that inspections are either impractical or unreliable. In such cases, the continued airworthiness of the airplane is assured by establishing a replacement time for the repair.

103. OVERVIEW OF DT DATA DEVELOPMENT AND INCORPORATION.

a. Developing DT data involves accomplishing tasks typically performed by a DAH assisted by interested operators. The product is an FAA-ACO approved model specific compliance document that contains the output from the tasks. Incorporation of the DT data into a maintenance program involves accomplishing tasks that are typically performed by an operator. The product is an FAA-PMI approved airplane specific Operator Implementation Plan.

b. It is expected that DAHs, operators and regulators would develop model specific compliance documents. Industry Task Groups such as the Airworthiness Assurance Working Group (AAWG) would perform this task.

c. The following is a summary of the tasks necessary to develop DT data for repairs and incorporate it into an operator's maintenance program:

(1) DAH Tasks. The following is an overview of the DAH tasks that are further developed in Chapter 2.

(a) Identify the affected airplane model, models, or airplane serial numbers the DT data will be applicable to.

(b) Identify the fatigue critical structure.

(c) Identify the certification level.

(d) Review of existing DT data.

(e) Develop additional DT data.

(f) Establish Implementation Schedule.

(g) Prepare Compliance Document**.** This is a model or airplane specific document that contains the information from Paragraphs (a) through (f) above. The operator will use this document to develop an implementation plan for complying with the AASFR. In order to support operator compliance to the AASFR, the DAH should submit the Compliance Document to the FAA-ACO for approval and should make it available by December 18, 2009.

(2) Operator Tasks. The following is an overview of the operator tasks that are further developed in Chapter 3.

(a) Review The Applicable Compliance Documents**.**

(b) Development Of An Operators Implementation Plan. This is specific to the identified airplane or group of airplanes to which the Plan applies and contains information from Paragraph **(1)(g)** above. The Operator will submit the Implementation Plan for approval by the FAA-PMI.

(c) Incorporate The DT Data For New And Existing Repairs into Operators Maintenance Program.

104 thru 199 RESERVED.

CHAPTER 2. DESIGN APPROVAL HOLDERS TASKS

200. GENERAL INFORMATION ABOUT THIS CHAPTER.

This chapter gives guidance to design approval holders for developing data to support operator compliance with the rule. This includes the development of damage tolerance procedures, DTE processes, and DT data.

201. DEVELOPMENT OF COMPLIANCE DOCUMENTS.

a. Persons supporting the operation of airplanes under 14 CFR 121 and 129 should use the following guidance material to develop data necessary to facilitate operator compliance. Airplanes certified to Amendment 54, or later, may not need additional DT data to be developed. While data may not need to be developed, an operator will still need to demonstrate to his PMI how his existing maintenance program meets the intent of the AASFR relative to new and existing repairs.

b. To facilitate compliance with the AASFR with respect to repairs, compliance documentation should be created that will encompass all fatigue critical structure, including repairs to repairs, alterations, and modifications (RAM) as necessary. The compliance document will be applicable to a specific airplane model or airplane serial number. The documentation should provide the data necessary for developing an Operator Implementation Plan with respect to a given airplane. The Compliance Document should also include implementation schedule information as well as specific guidance on which repairs will require evaluation. The process for evaluation of repairs contained in this AC considers both existing and future repairs. Existing repairs will be brought into the program using the implementation plan and airplane surveys after December 20, 2010 (See Appendix 5). New repairs, installed after December 20, 2010 will be required to have DT data provided within the guidelines contained in Appendix 4.

c. Where specific DT data needs to be developed to support compliance to the AASFR, it is recommended that the model-specific Compliance Document be produced as a joint effort between the DAH, operators, and Regulatory Authorities. In previous aging aircraft programs, the AAWG formed Structures Task Groups (STGs) to develop the model specific programs. Where necessary an STG for this activity should be formed and tasked to develop the model-specific Compliance Document.

d. Figure 1 shows the process that may be used to produce a Compliance Document that supports compliance with the AASFR for repairs to fatigue critical structure:

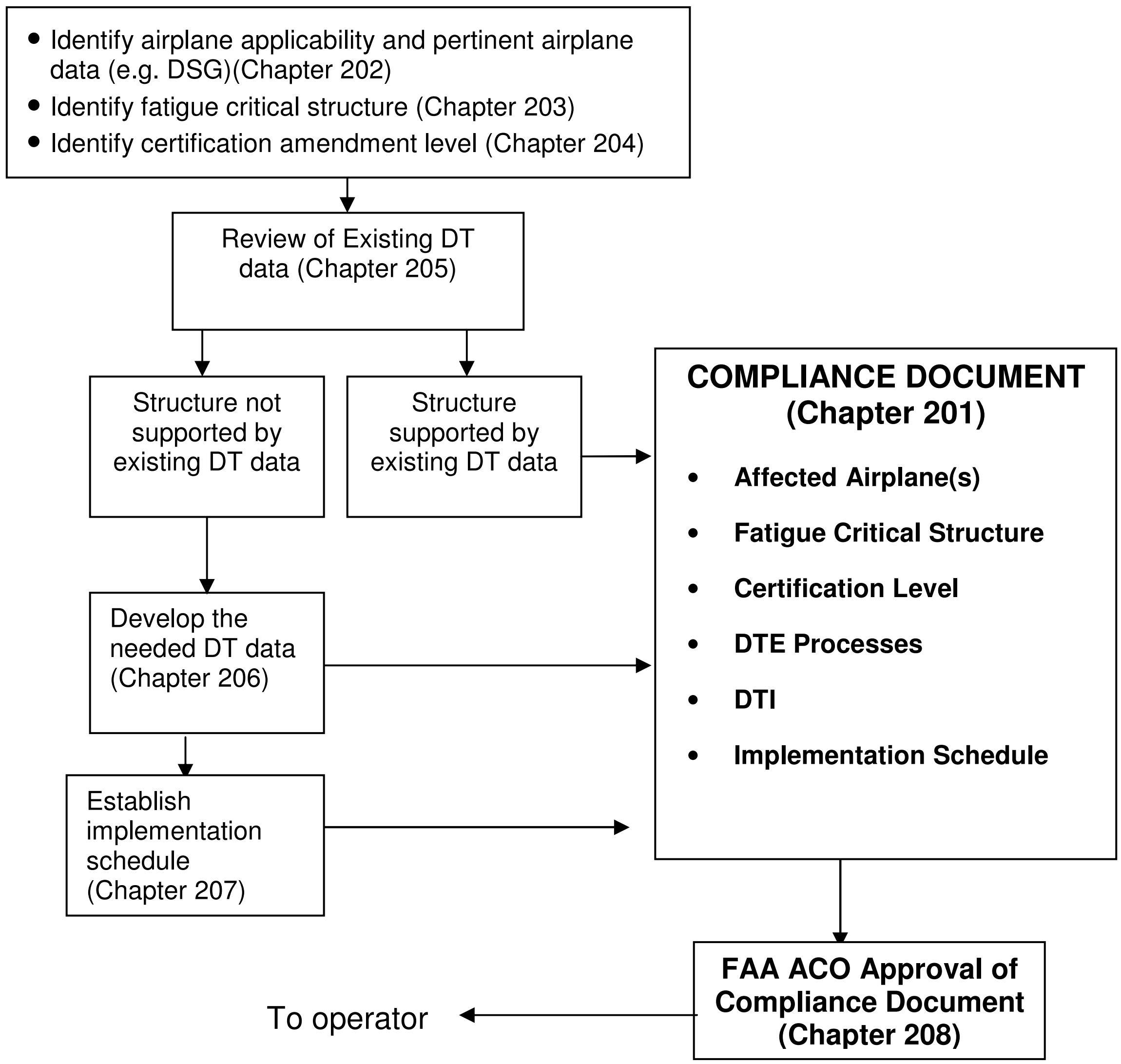


Figure 1. Development of a Compliance Document.

202. IDENTIFICATION OF AFFECTED AIRPLANES.

The airplane model and model variations or serial numbers, including gross weights, applicable to the Compliance Document should be identified. For each model of airplane, the DAH will identify the DT data to support compliance with the AASFR. Some models may not require additional data

203. IDENTIFICATION OF FATIGUE CRITICAL STRUCTURE.

a. The DAH will identify and make available in the Compliance Document a description of structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure for each applicable airplane model. This structure is referred to as "fatigue critical structure". Guidance for identifying this structure can be found in AC 25.571-1C. When fatigue critical structure is repaired the repaired fatigue critical structure requires DTE to comply with the AASFR. This includes repairs to alterations and modifications of fatigue critical structure. Structure not defined as fatigue critical structure would not require DTE when repaired.

b. When identifying fatigue critical structure, it should be considered that some SSID programs or ALS contained in the Instructions for Continued Airworthiness might only include supplemental inspections of critical elements of the fatigue critical structure as determined by the Damage Tolerance Analysis. Other areas of structure may require supplemental inspections if repaired. In defining the fatigue critical structure it is not sufficient to consider only that structure contained in the SSID program or ALS.

c. STC Holders should obtain the description of fatigue critical baseline structure from the Type Certificate Holder. If the alteration affects this fatigue critical structure, any repairs to the alteration must have a Damage Tolerance Assessment performed. This damage tolerance assessment must address any fatigue critical structure of the alteration and of the baseline structure that is affected by the repair. This information should be incorporated into a compliance document that is unique to the alteration.

204. CERTIFICATION AMENDMENT LEVEL.

In order to understand what data is required for compliance with the AASFR for repairs, the DAH should identify the amendment level of the original certification relative to 14 CFR Part 25.571. The amendment level is useful in identifying what DT data may be applicable for compliance to the AASFR and what standard should be used for development of data for AASFR compliance. The two airplane groups that are relevant to the AASFR are:

a. Group A - Airplanes certified before 14 CFR 25.571 Amendment 25-45, damage tolerance requirements. These airplanes were not evaluated for damage tolerance as part of the original type certification. Therefore, the requirements of the AASFR are beyond the scope of the original certification amendment level. Repairs to fatigue critical structure will need development of DT data unless previously accomplished.

b. Group B - Airplanes certified to 14 CFR 25.571 Amendment 25-45 or beyond, Repairs to these aircraft will need to meet their certification level. Although these airplanes were evaluated for damage tolerance, they may not have repair data that includes DT data. In this situation, the DAH and operators may need to identify and perform a DTE of these repairs and develop DTI or other procedures.

205. REVIEW OF EXISTING DT DATA.

a. Introduction

(1) Based on the certification amendment level and existing rules, the DAH developed documents that may provide DT data to support compliance with the AASFR for repairs. These documents may include:

- **(a)** Repair Assessment Guidelines (RAG)
- **(b)** Structural Repair Manual
- **(c)** Individual Repairs
  - **i** To areas covered by ALS, SSIP and RAP
  - **ii** Other individual repairs
- **(d)** Service Bulletins that provide
  - **i** Inspections for RAMs
  - **ii** Significant modification or
  - **iii** Repair service bulletins
- **(e)** ADs that mandate
  - **i** Modifications or repairs
  - **ii** Inspections to STCs

(2) Review each of the items above to determine the applicability of the data for compliance to the AASFR.

b. Identifying Existing DT Data.

(1) Identify repairs that have existing DT data that will support compliance with the AASFR. This material will form a portion of the data for the Compliance Document.

(2) The following documents may contain data that may be applicable in showing compliance to the AASFR.

(a) RAGs. The programs developed for complying with §121.370 and 129.32 resulted in model specific repair assessment guidelines (RAGs). These documents provide support in complying with the AASFR for repairs to the fuselage pressure boundary. Additionally, under certain circumstances, the RAG documents developed may be applicable to repairs to STC's that are modifications to the fuselage pressure boundary.

(b) SBs, ADs. Review Service Bulletins and ADs that provide instructions to inspect, or repair fatigue critical structure. Determine if it supports compliance with the AASFR. The DAH should propose a process for review of these bulletins.

(c) SRMs. The Structural Repair Manual may contain some of the information required for compliance to the AASFR and other existing programs, such as the SSIP and RAP. Review SRMs to identify all repairs to fatigue critical structure and if those repairs have had DT data established.

206. DEVELOPMENT OF ADDITIONAL DT DATA TO SUPPORT COMPLIANCE.

a. Introduction.

(1) When developing DT data, use of the damage tolerance requirements depends on the certification level of the affected airplane. For Group A airplanes use the requirements of 14 CFR 25.571 at Amendment 45 as a minimum standard. For Group B airplanes use the requirements that correspond to their original certification level as a minimum standard.

(2) Consider the following repairs and develop DT data according to the minimum standard determined in (1) above:

(a) SRM Repairs.
(b) SB Repairs.
(c) AD Mandated Repairs.
(d) DAH reviewed and approved repairs that have general interest (multiple airplane approvals).
(e) Other repairs, including third-party approved repairs and repairs that deviate from published repairs that otherwise qualify as damage tolerant.

(3) For future repairs, damage tolerance evaluation on an individual repair basis is acceptable. However, it may be more efficient to use published repair instructions such as SRMs or RAGs that contain already approved DT data. For published repair data to be acceptable, it should contain a statement of DTE accomplishment.

(4) For existing repairs that are identified during an individual airplane review, there are at least two possible approaches to evaluate a repair. The first would involve a damage tolerance analysis on individual repairs as those repairs are identified. This will be necessary for unique and complex non-routine repairs. Another approach would be to develop guidelines to assess repairs that are not addressed by existing RAGs developed for compliance to 14 CFR 121.370. The development of these additional guidelines is complex and therefore requires the support of the DAH.

b. Performing DTEs and developing DTI on a case-by-case basis. If performing DTEs and developing DTI on a case-by-case basis, use the guidance included in AC 25.571 consistent with the certification amendment level identified in Chapter 2, paragraph 204 of this AC.

c. Development of additional repair assessment guidance. The update of the SRM, SBs, together with the existing RAG documents form the core of the information supplied to the operator for compliance to the AASFR. A means will be developed and documented in the compliance document to assist the operator in evaluating repairs using the updated published standards and to determine if additional DAH support is necessary. This support may be in the form of individual repair DTA data requests or new repair evaluation guidelines (e.g. may cover fatigue critical structure of the wing, fuselage, empennage, etc.). The means developed should provide operators with a high degree of confidence that they can comply with the requirements of the AASFR.

In the development of new evaluation guidelines, the percentage of existing repairs that could be addressed by the new repair guidance material should weighed against the resources and time required to develop and have the guidance approved. General guidance on development of this material can be found in AC 120-73 even though this guidance is for the Fuselage Pressure Boundary.

Damage tolerance inspections and procedures means establishing the following:

(1) A threshold for when to commence inspections of the structure.
(2) A repetitive interval for repeat inspections
(3) A means of inspection.
(4) Occasionally, a life limit for replacing structure.

For repairs, the following repair category terminology that is contained in AC 120-73 is used herein to describe the maintenance requirements.

For Category A repairs, normal maintenance procedures (inspection threshold and /or BZI) are sufficient to provide the required damage tolerance coverage.

For Category B repairs, items 1, 2, and 3 above are normally provided as part of the damage tolerance package.

For Category C repairs, all four items are provided as necessary.

d. SRMs. Based on the review performed in Chapter 205, determine if the SRM needs revision to support compliance with the AASFR. Base this determination on the following:

(1) Whether the existing SRM contains an adequate description of damage tolerance data for the specific model. This includes defined repair categories.

(2) Whether normal maintenance procedures (for example the inspection threshold and/or baseline zonal inspection program) covers Category A repairs.

(3) Whether the SRM contains an identification of fatigue critical structure for the model specific airplane that, if repaired, will need a damage tolerance assessment.

(4) Whether SRM Chapter 51 standard repairs have a DT evaluation.

(5) Whether all SRM specific repairs for fatigue critical structure have DT Data.

(6) Whether there is specific guidance on the size of repairs that would qualify as Category A repairs.

(7) Whether there is any guidance on proximity of repairs and the effect of this condition on damage tolerance characteristics.

(8) The need to address superseded repairs and how DT data for future superseded repairs will continue to be made available.

e. Service Bulletins. Based on the review performed in Chapter 205 determine if the SBs need DT data to support compliance with the AASFR. Compliance Document needs to identify the status of the DT data for those service bulletins.

207. IMPLEMENTATION SCHEDULE.

The implementation schedule described in this Paragraph represents an acceptable time line to establish DT data and continued airworthiness maintenance plans for both existing and new repairs. Justify any deviation to the time line and present it to the FAA oversight office for approval. Include the information contained in this chapter in the Compliance Document to support the operator in developing an implementation plan for his particular fleet of airplanes. This Implementation Schedule will support compliance to 14 CFR 121.370a (1) with respect to the requirement to address the adverse effects repairs have on fatigue cracking and the inspection of fatigue critical structure. In principle this implementation schedule is similar to the implementation schedule adopted for compliance to 14 CFR 121.370.

a. Existing repairs that already have DT data developed and in place in the maintenance program. These repairs require no further action.

b. Existing repairs that either require developing DT data or have not had ICA embodied in the maintenance program. Identify and evaluate all existing repairs to fatigue critical structure. For the purposes of compliance to the AASFR, only existing repairs that reinforce (e.g. restore strength) the fatigue critical structure need to be considered; this typically excludes maintenance actions such as blend-outs, plug rivets, trim-outs, etc. For those existing repairs that do not have DT data or other procedures implemented, establish that data according to an FAA approved plan. Assessing existing repairs consists of:

- Airplane Repair Survey.
- Identification and Disposition of repairs requiring immediate action.
- DTI Development.

Appendix 5 defines these three steps. The timing allowance for each of these steps for any given airplane depends on the age of the airplane on December 18, 2009. The following program will support the DAH development of an Implementation Schedule for the Compliance Document. This implementation schedule would be incorporated as part of the Operator's Implementation Plan developed in Chapter 3 of this AC.

(1) Implementation Schedule for Survey and Disposition.

(a) Airplanes less than 75% DSG on December 18, 2009. Operators would complete a survey at the first D-check after 75% DSG, not to exceed DSG, completing steps 1 and 2 of the DTI assessment process (see Appendix 5). After accomplishing step 1, complete step 3 of Appendix 5 within 12 months.

(b) Airplanes between 75% DSG and DSG on December 18, 2009. Operators would complete a survey of these airplanes completing steps 1 and 2 of the DTI assessment process (see Appendix 5) at or before the next major check (equivalent to a D-check) after December 20, 2010, not to exceed DSG or 6 years whichever is greater. After accomplishing step 1, complete step 3 of Appendix 5 within 12 months.

(c) Airplanes greater than the DSG on December 18, 2009. Operators would complete a survey of these airplanes completing steps 1 and 2 of the DTI assessment process (see Appendix 5) at or before the time limit equivalent to a D-check after December 20, 2010, not to exceed 6 years. Operators should not defer the implementation of the program until the end of the D-check time period. For example, if an operator had 30 airplanes over DSG on December 18, 2009 and was operating on a six year D-check equivalent, the operator would inspect approximately 5 equivalent airplanes each year until all of the airplanes were inducted into the program. Within 12 months after accomplishing Step 1, complete step 3 of Appendix 5.

NOTE: The DAH will identify the established DSG for a particular airplane type that is representative of the airplane considering the probable variation of the number of flight hours per cycle that could exist in the fleet.

(2) Implementation of DTI.

(a) Once the DTI is known, accomplish the first inspection of the repair according to the schedule of the DTI as follows:

i Inspect the repair before the inspection threshold or within a time limit equivalent to a C-check from accomplishment of the assessment, whichever occurs later.
ii If the age of the repair is unknown, use the aircraft age in cycles or hours.

(b) Implement repeat inspection intervals per the instructions provided.

d. New Repairs. Unless already required by the airplane certification level or other FAA approved program, all new repairs to fatigue critical structure installed beginning December 21, 2010, and thereafter must have DTE performed. Implement DTI according to the process described in Appendix 4, “Approval Process for New Repairs”. This includes blendouts, trim-outs, etc. that are beyond published DAH limits.

e. Repairs to Removable Structural Components. Fatigue critical structure may include structure on removable structural parts or assemblies that can be exchanged from one aircraft to another such as door assemblies, flight control surfaces, etc. In principle, the DT data development and implementation process also applies to repairs to fatigue critical structure on components. During their life history, however, these parts may not have had their flight times recorded on an individual component level because of removal and reinstallation on different airplanes multiple times. These actions may make it impossible to determine the age or total hours/cycles. In these situations, guidance for handling DT data development and implementation for existing and new repairs is given in Appendix 6.

208. FAA ACO APPROVAL OF COMPLIANCE DOCUMENT.

The FAA oversight office for the affected airplane or STC will approve the Compliance Document and any revision to an FAA-approved Compliance Document.

209 THRU 299 RESERVED.

CHAPTER 3. OPERATOR TASKS

300. GENERAL INFORMATION ABOUT CHAPTER 3.

This Chapter will guide operators on the procedures to obtain damage tolerance inspections and procedures. This Chapter will additionally guide operators on how to revise their maintenance programs as required by 14 CFR 121.370a and 129.16.

301. DEVELOPMENT OF AN OPERATORS IMPLEMENTATION PLAN

The AASFR requires affected air carrier certificate holders to incorporate FAA-approved DTE Processes and DTI into their maintenance programs by December 20, 2010 for repairs to fatigue critical structure. This includes both existing and new repairs and repairs to repairs, alterations and modifications of fatigue critical structure. The means of incorporating DT data into a certificate holder's FAA-approved maintenance program is subject to approval by the certificate holder's Principal Maintenance Inspector (PMI) or other airworthiness inspector. The Compliance Document developed using Chapter 2 of this AC provides the basic guidance, including identification of the fatigue critical structure, DT data and implementation schedule information.

Incorporate the information that includes the Compliance Document processes, data, and requirements into the operator's existing maintenance program in a way that best fits their existing maintenance programs. The PMI or airworthiness inspector will then approve the Operator's Implementation Plan.

302. REVIEW OF APPLICABLE COMPLIANCE DOCUMENTS.

a. For each affected airplane in an operator's fleet, the operator should review the FAA ACO-approved Compliance Documents (discussed in Chapter 2, above) that are applicable. The Compliance Document will identify all fatigue critical structure, the DT data for the fatigue critical structure, and implementation schedule information for incorporating DT data into the operator's maintenance program.

b. In addition, the operator should review any additional FAA ACO approved Compliance Documents associated with a given model aircraft, for repairs to RAMs and third-party approved repairs. These may be applicable to the entire model fleet or to individual aircraft within a given fleet type. These Compliance Documents will also identify all fatigue critical structure for that fleet type, the DT data for the fatigue critical structure, and implementation schedule information for incorporating DT data into the operator's maintenance program.

c. Figure 2 below shows how an operator can develop an Operator Implementation Plan for airplanes in his fleet using the Compliance Document. While the

Implementation Plan is airplane specific, it may incorporate processes and procedures that are applicable to other airplanes operated by a certificate holder. This includes administrative procedures for applying elements common to each Implementation Plan. Consider the guidance in the following flow-chart when developing an Operator Implementation Plan.

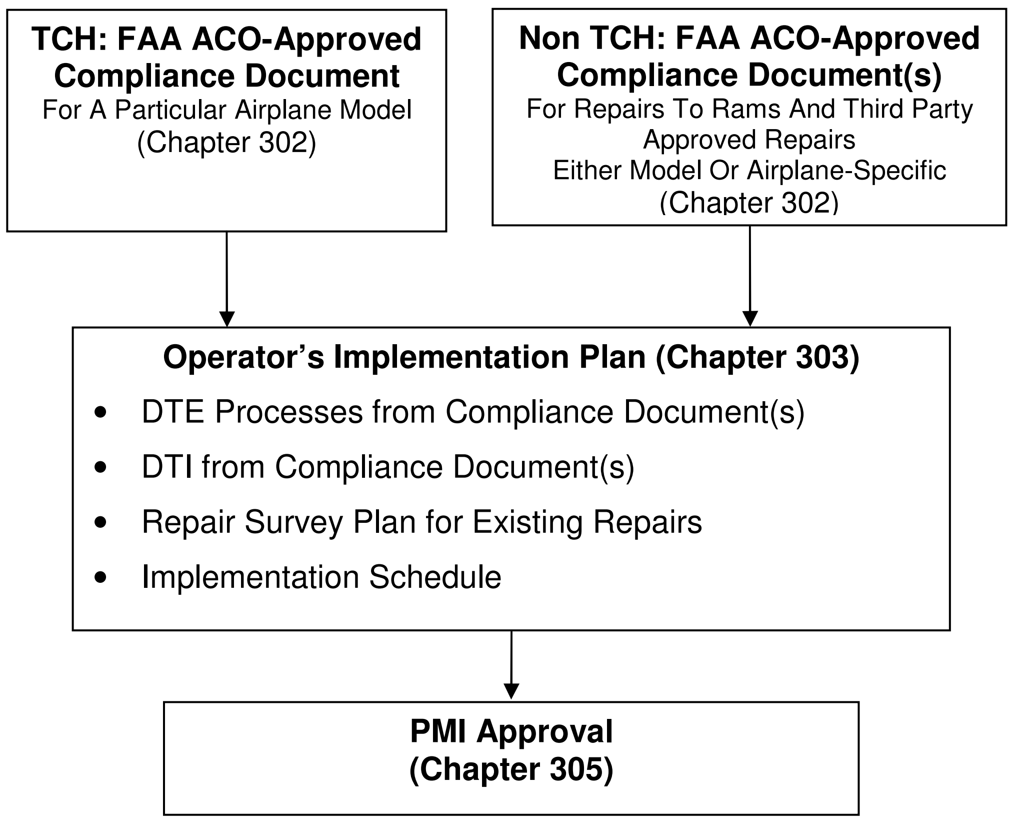


Figure 2. Operator's Implementation Plan Approval Process.

303. INCORPORATION OF DT DATA FOR NEW AND EXISTING REPAIRS.

After the reviews of the applicable Compliance Document are complete, the operator should include the following into an Operator Implementation Plan:

a. A process to ensure that all new repairs to fatigue critical structure will be evaluated for damage tolerance and have DTI or other procedures implemented.

b. A process to ensure that all existing repairs to fatigue critical structure are evaluated for damage tolerance and have DTI or other procedures implemented. This process would include:

(1) A review of operator processes to determine if DT data for fatigue critical structure is incorporated throughout the life of the airplane. If so, no further action is required for existing repairs.

(2) Incorporation of processes to survey existing repairs to fatigue critical structure and determine DTI for those repairs. Derive these processes from the Compliance Document applicable to those airplanes. Incorporate them into the operator's maintenance program within the time frame given in the Compliance Document.

c. An implementation schedule following guidance provided in the Compliance Documents.

d. Repair Survey Plan. Utilizing the survey parameters from chapter 2 above the operator would devise a plan to survey its airplanes for repairs that may need DT data developed. This survey plan may be divided into three groups of airplanes, those that are below 75% DSG, those that are between 75% DSG and DSG and those above DSG on December 18, 2009. (Note: In the following three-implementation plans, DSG is in cycles.) Examples of typical calculations to determine when an airplane would need to be surveyed are contained in Appendix 8.

(1) For an airplane that has not reached 75% DSG on Dec. 18, 2009. The operator must perform the survey at the first D-check after 75% DSG, not to exceed DSG. A "D" check or equivalent means an airplane maintenance visit where all the major structural inspections are performed. In some cases this may be a formal "D" check or, in the case of MSG-2 or 3 based maintenance program, the "D" check equivalent may be the "C" check multiple that contains the majority of the major structural inspections such as a "C-4" check sometimes called a Heavy Maintenance Visit (HMV).

(2) For an airplane that has reached 75% DSG but is less than or equal to DSG on Dec. 18, 2009. The operator must perform the survey at the next D-check, not to exceed DSG or 6 years whichever is greater.

(3) For an airplane that has exceeded DSG, the survey should be accomplished before the time limit of the next "D" check, or 6 years, which ever is earlier. Operators should have a procedure in place to prorate airplane surveys in order to evenly spread out the surveys that need to be accomplished over the six-year time frame.

e. Implementation Techniques. Use one of the two techniques below to implement DTI for repairs:

(1) The first technique involves incorporation of DT data directly into the operator's maintenance program.

(2) The second technique involves an alternative to tracking individual repairs. In this approach, incorporate the DTI as part of an operator's routine maintenance program. This approach is well suited for operators of large fleets and would entail evaluating repairs at predetermined planned maintenance visits as part of the maintenance program. This technique would require the operator to choose an inspection method and interval using an FAA-approved DTE. Use the regular FAA-approved maintenance or inspection program for repairs where the inspection requirements utilize the chosen inspection method and interval. Repairs added between the predetermined maintenance visits, including Category B and C repairs installed at remote locations, should have a threshold greater than the predetermined maintenance visit. It may also be individually tracked to account for the repair's unique inspection method and interval requirements. This would ensure the airworthiness of the structure until the next predetermined maintenance visit, when the repair would be evaluated as part of the repair maintenance program.

Category B or C repairs where inspection requirements are not fulfilled by the chosen inspection method and interval would need additional attention. These repairs would either require upgrading to allow utilization of the chosen inspection method and interval, or individually tracking to account for the repair's unique inspection method and interval requirements.

Note: DTI thresholds and repeat intervals for individual repairs cannot be exceeded without FAA approval.

304. EXISTING OPERATOR RESPONSIBILITIES.

a. Reporting Requirements. There are no added reporting requirements associated with the AASFR. However, the FAA encourages operators to report significant findings to the type certificate holders to ensure that prompt fleet action is taken. Existing reporting requirements under 14 CFR § 121.703 still apply.

b. Recordkeeping Requirements. Once the Operator receives approval for the Implementation Plan, include the list of the required inspections and their status in the records review requirements of §§121.368 and 129.33. Existing recordkeeping requirements are still applicable.

c. Transfer of Airplanes after December 20, 2010. After December 20, 2010, before adding an airplane to an air carrier's operations specifications or operator's fleet, the following should apply:

(1) For airplanes previously operated under an FAA-approved maintenance program, the new operator may use either the previously PMI approved Operator Implementation Plan or their own PMI approved Implementation plan.

(2) For airplanes not previously operated under an FAA-approved

maintenance program, the operator develops and implements an Operator Implementation Plan. If the airplane's DSG and compliance times are exceeded, accomplish any outstanding DTI according to a schedule approved by the PMI.

d. Operation of Leased Foreign-Owned Airplanes. Acquisition of a leased foreign-owned airplane for use in operations under 14 CFR parts 121, or 129 will require the certificate holder to develop and implement an Operator's Implementation Plan

e. Maintenance Program Changes. When revising a maintenance program and the continued airworthiness of repairs to fatigue critical structure is dependent on that program, the operator must evaluate the impact of the change on continued airworthiness. For example, the maintenance program inspection intervals may determine Category A repairs (Ref AC 120-73, Stage 2: Repair Classification). If revising the maintenance program in a manner that changes the inspection intervals, the operator must assess that effect on repairs that are Category A.

305. FAA PMI APPROVAL OF OPERATOR'S IMPLEMENTATION PLAN.

The certificate holder's Principal Maintenance Inspector (PMI) or other airworthiness inspector is responsible for approving the means for incorporation of the DT data for repairs into a certificate holder's FAA-approved maintenance program. An operation specification revision will show approval of the plan.

306. THRU 399 RESERVED.

CHAPTER 4. ADMINISTRATIVE REQUIREMENTS

400. ADVISORY CIRCULAR AVAILABILITY

HOW DO I GET A COPY OF THE PUBLICATIONS REFERRED TO IN THIS AC?

a. The CFR and those ACs for which a fee is charged may be obtained from the Superintendent of Documents at the following address. A listing of the CFR and current prices is located in AC 00–44, *Status of Federal Aviation Regulations*, and a listing of all ACs is found in AC 00–2, *Advisory Circular Checklist*.
Superintendent of Documents
P.O. Box 371954
Pittsburgh, PA 15250–7954

b. To be placed on our mailing list for free ACs, contact—
U.S. Department of Transportation
Subsequent Distribution Office
SVC–121.23
Ardmore East Business Center
3341Q 75th Avenue
Landover, MD 20785

c. You may view and print the CFR and Aircraft Certification Service and Flight Standards Service ACs on the FAA Web page at http://www.airweb.faa.gov/rgl.

401. WHO DO I CONTACT FOR MORE INFORMATION ABOUT THIS AC?

For information concerning this AC, contact the Transport Airplane Directorate, ANM-115 at 425-227-2116.

402. WHO DO I SUBMIT COMMENTS TO ABOUT THIS AC?

Submit direct comments regarding this AC to—
U.S. Department of Transportation
Federal Aviation Administration
Aircraft Maintenance Division, AFS-300
800 Independence Avenue SW.
Washington, DC 205

403 THRU 499 RESERVED.

APPENDIX 1. RELATED REGULATIONS AND DOCUMENTS

The following is provided as a means to access current rules and regulations together with previous ARAC Recommendations from the AAWG. Documents noted by an (*) are available at the following web site.

http://www.faa.gov

1. Title 14 of the Code of Federal Regulations (14 CFR): The following Regulations are referenced in this AC:

a. Part 21, §21.101*
b. Part 25, §§ 25.571*, 25.1529*
c. Part 43, §§ 43.13*, 43.16*
d. Part 91, § 91.403*
e. Part 121, §§ 121.368*, 121.370*, 121.370a*
f. Part 129, §§ 129.16*, 129.32*, 129.33*

2. Advisory Circulars (AC): The following Advisory Circulars are reference in this AC:

a. AC 21.101-1, Change Product Rule*
b. AC 25.571-1, Damage Tolerance and Fatigue Evaluation of Structure*
c. AC 25.571-1A, Damage Tolerance and Fatigue Evaluation of Structure*
d. AC 25.571-1B, Damage Tolerance and Fatigue Evaluation of Structure*
e. AC 25.571-1C, Damage Tolerance and Fatigue Evaluation of Structure*
f. AC 25.1529-1, Instructions for Continued Airworthiness of Structural Repairs on Transport Airplanes*
g. AC 91-56A, The Continued Airworthiness of Older Airplanes*
h. AC 91-56B, The Continued Airworthiness of Older Airplanes*
i. AC 120-73, Damage Tolerance Assessment of Repairs to Pressurized Fuselages*

3. Other Documents referred to in this AC:

a. A Final Report of the AAWG – Continued Airworthiness of Structural Repairs*
b. A Report of the AAWG – Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Airplane Fleet*
c. A Report of the AAWG - Recommendations For Regulatory Action To Enhance Continued Airworthiness Of Supplemental Type Certificates*
d. Repair Assessment Guidelines, FAA Approved Model Specific Guideline Documents**
e. FAA Approved Model Specific Supplemental Inspection Documents**
f. ATA Report 51-93-01***
g. ATA Response to FAA Docket 1999-5401 Dated May 5, 2003***
h. Federal Register/Vol. 69, No. 146/Friday, July 30, 2004/Rules and Regulations Fuel Tank Safety Compliance Extension (Final Rule) and Aging Airplane Program Update (Request for Comments). Page 45936*

** Various manufacturers publish these documents. Please contact those manufacturers to determine the general availability of the documents.

*** Please contact the ATA.

APPENDIX 2. DEFINITIONS AND ACRONYMS

a. Supplemental Structural Inspection Program (SSIP) is a damage-tolerance-based inspection program. SSIPs only address the structure identified by the type certificate holder using the guidance contained in AC 91-56.

b. Instructions for Continued Airworthiness (ICA) are maintenance actions defined by the TC or STC holder and delivered with the airplane in accordance with 14 CFR 25.1529. ICA are documented information that includes the applicable methods, inspections, processes, procedures and airworthiness limitations.

c. Airworthiness Limitations Section (ALS) is a collection of mandatory maintenance actions required for airplane structure and fuel tank system. For structural maintenance actions, the ALS includes structural replacement times, structural inspection intervals, and related structural inspection procedures.

d. Repair Assessment Program (RAP) is a program that incorporates damage tolerance based inspections for repairs to the fuselage pressure boundary structure into the operators FAA approved maintenance and/or inspection program as required by 14 CFR 121.370.

e. Design Approval Holder (DAH) is a person that holds a type design approval for an airplane or any FAA approved data necessary to repair, alter, or modify airplane structure.

f. Type Design consists of drawings and specifications; information on dimensions, materials, and processes; airworthiness limitations; and any other data necessary to describe the design of the product.

g. Damage Tolerance Evaluation (DTE) a process that leads to a determination of continuing airworthiness inspections and other procedures for a repair using damage tolerance procedures as defined in AC 25.571-1, 1A, 1B, or 1C.

h. Damage Tolerance Inspections (DTI) inspections and other procedures that are a result of a DTE process. These should include the location of the airplane structure to be inspected, and the threshold and interval associated with those inspections, inspection method, and/or, in some cases, removal limits.

i. DT data refers collectively to the DTE processes and DTI needed by an operator to address repairs as required by the AASFR.

j. Repair is the restoration of an item to a serviceable condition in conformity with an approved standard.

k. Airplane structural configuration is the approved original type certificate design,_including any model variations or derivatives; and alterations or replacements mandated by AD.

l. Structures Task Group (STG) is a model specific group. The STG comprises design approval holders and operators who are responsible for the development of aging airplane mod specific programs. It also includes regulatory authorities who approve and monitor those programs.

m. Alteration or modification is an FAA-approved design change that is made to an airplane. Within the context of this AC these terms are considered synonymous. Both terms are purposely used herein to be all inclusive of any design change and to avoid potential misinterpretation of intent of these terms.

n. Amended Type Certificate (ATC) is a process where the original OEM may modify the airplane and have the modification approved by amending the original type certificate under 14 CFR 21. 177.

o. Design Service Goal (DSG) is the period of time (in flight cycles/hours) established at design and/or certification during which the principal structure will be reasonably free from significant cracking.

p. Repair Assessment Guidelines (RAG) a document that provides a means to establish a damage tolerance based inspection program for repairs to detect damage that may develop in a repaired area before that damage degrades the load carrying capability of a structure below the levels required by the applicable airworthiness standards.

APPENDIX 3. BACKGROUND

a. Fatigue is recognized as a significant threat to the continued airworthiness of airplanes. This is because even small fatigue cracks can significantly reduce the strength of the structure they are in. Consistent with this the airworthiness standards for certification of new transport category airplanes have always addressed fatigue with the intent of avoiding catastrophic failures because of fatigue throughout the operational life of the airplane. However these requirements have not remained unchanged. They have evolved over-time as the relevant knowledge base has increased because of service experience, specific incidents and accidents that have occurred and technological advances in design, analysis, testing, manufacturing, and inspection.

b. One of the first significant changes in the standards occurred in March 1956 with revision of the Fatigue Evaluation requirements contained in CAR 4b.270 to add "Fail-safe strength" as an option to the "Fatigue strength" approach for addressing fatigue. Motivation for this change was the realization that precluding fatigue cracking from occurring might not always be possible and therefore, as an option, the structure may be designed to survive cracking even if it occurred. The fatigue strength approach tries to achieve a design where fatigue cracking is not probable within the operational life of the airplane. The fail-safe approach assumed that cracking could occur while maintaining a specified minimum strength after a "fatigue failure or obvious partial failure" had occurred. The efficacy of the fail-safe approach was not only dependent on the structure keeping the specified minimum strength with the fatigue damage present but also on the finding the damage during normal maintenance. As applied, the fail-safe approach emphasis is on redundancy as opposed to fatigue performance while inspectability is assumed and not quantified. The fail-safe option was the predominate approach chosen for the most large transport category airplanes certified in the 1960s and 1970's.

c. Another significant change in the airworthiness standards for fatigue occurred in October 1978 with amendment 25-45 with revision and deletion of §§ 25.571 and 25.573 of 14 CFR Part 25 respectively. This change involved removing the fail-safe option entirely and establishing a new requirement to develop damage tolerance based inspections wherever practical. The fatigue strength approach, as a default option, is used only if the damage tolerance approach is impractical. The motivation for the 1978 change is a recognition, based on mounting evidence, the fail-safe approach applied up to that point is not reliable and will not achieve the desired level of safety. Specific areas of concern with the fail-safe approach included the loss of fail-safety with age. This is because of the increased probability of cracking in the structure adjacent to the fatigue failure or obvious partial failure and the lack of directed inspections and quantification of residual life with the assumed damage present. It was agreed at the time that more emphasis is needed on where and how fatigue cracking could occur in the structure and on quantifying crack growth and residual strength characteristics. This includes damage tolerance characteristics and development of effective inspection protocols such as where, when, how and how often to inspect. The 1978 changes achieved this for new transport category airplane certification.

d. The same events and reasoning that drove the changes to airworthiness standards for new airplane also influenced the strategy adopted to ensure the continued airworthiness of the existing fleet. There was increasing concern about existing older airplanes certified according to the fail-safe requirements of CAR 4b.270. Eleven large transport models were specifically identified as needing the most attention. It was decided to develop damage tolerance based inspection programs and implement them for these airplanes. These inspections supplement existing maintenance inspections and thus these programs were referred to as Supplemental Structural Inspection Programs (SSIPs). The inspection requirements were documented in Supplemental Inspection Documents (SIDs). It was also agreed that SIDs would be developed by the Original Equipment Manufacturers on a voluntary basis and then mandated by Airworthiness Directive (AD). The CAA published guidance for developing the SSIPs in Airworthiness Notice No. 89, Continuing Structural Integrity of Transport Aeroplanes dated August 23, 1978 and by the FAA in Advisory Circular No. 91-56, Supplemental Structural Inspection Program for Large Transport Category Airplanes dated May 6, 1981. Subsequently SSIPs were developed and mandated by AD for the eleven aging models. Little or no consideration was given to repairs, alterations or modifications (RAMs). Airworthiness Directives that mandated the SSIP programs addressed some RAMs.

e. In April 1988 one of the eleven aging models, for which a SSIP had been developed and mandated by AD, suffered major structural damage to its pressurized fuselage structure because of undetected fatigue cracking of the baseline primary structure. This accident was attributed in part to the aging of the airplane involved. It precipitated actions culminating regulations aimed at avoiding catastrophic failures from fatigue in existing and future airplanes.

f. In response to the April 1988 accident the FAA sponsored a conference on aging airplane a establishing a task force representing the interests of the airplane operators, airplane manufacturers, regulatory authorities and other aviation representatives. In addition, other recommendations from this task force specifically recommended consideration of damage tolerance for repairs. In direct response to these recommendations changes to parts 91, 121, 125 and 129 of Title 14 of the CFR occurred in April 2000. This required operators to incorporate damage tolerance based inspections for existing and future repairs to the fuselage pressure boundary for the eleven aging models previously identified. This did not address other models and repairs to other structure.

g. The April 1988 accident also precipitated congressional legislation. In October 1991 Congress enacted Title IV of Public Law 102-143, the “Aging Airplane Safety Act of 1991” (AASA). Two key elements of the AASFR are as follows:

(1) Required "the Administrator to make such inspections and conduct such reviews of maintenance and other records of each airplane used by an air carrier to provide air transportation as may be necessary to determine that such is in a safe condition and is properly maintained for operation in air transportation".

(2) Specified that an air carrier must be able to demonstrate as part of the inspection "that maintenance of the airplane's structure, skin, and other age sensitive parts and components have been adequate and timely enough to ensure the highest level of safety".

h. Although the AASA did not define specifics of what had to be done, the one clear intent was to avoid catastrophic failures because of fatigue throughout the operational life of each affected airplane. Consistent with this, and the damage tolerance requirements adopted in 1978 for new transport category airplanes, FAA initiated rulemaking that would require broader implementation of damage tolerance based structural inspection programs. This would apply to almost all multiengine airplanes used in scheduled passenger service. Additionally the intent was to address all structure where fatigue cracking could result in catastrophic failure.

i. In response to the AASA, the FAA rulemaking efforts eventually resulted in the issuance of the Aging Airplane Safety Interim Final Rule (AASIFR) on December 6, 2002. This rule required implementation of damage tolerance based inspection programs for all airplanes operated under 14 CFR 121 and 129 operations. Also all multi-engine airplanes engaged in 129 or 135 operations that were initially certificated with 10 or more passenger seats by December 8, 2007. Airplanes operated between any point within the State of Alaska and any other point within the State of Alaska is exempt.

j. The AASIFR was subsequently amended and finalized on February 2, 2005, to the Aging Airplane Safety Final Rule (AASFR). The revised rule requires implementation of damage tolerance based inspection programs by December 20, 2010. This applies to airplanes engaged in 121 or 129 operations with type certificated seating capacity of 30 or more or a payload capacity of 7,500 pounds or greater. Airplanes operated within Alaska remain exempt. Although the scope has been reduced, it still affects the majority of airplanes engaged in scheduled passenger carrying service. Relative to damage tolerance based inspection programs it raises the level of safety on the existing fleet of affected airplanes to the same level required for current transport category airplane type design approvals.

APPENDIX 4. APPROVAL PROCESS FOR NEW REPAIRS

In the past, AC 1529-1 allowed a two-stage approach in approving repairs to PSEs. The two-stage approach consisted of:

- Type design strength requirements of section 25.305 before return to service
- Damage tolerance evaluation performed and DT data developed to demonstrate compliance with section 25.571 within 12 months of return to service.

The guidance material in AC 1529-1 is now embodied in this guidance material and modified to allow a three-stage approach now commonly used in the industry.

The DT data includes inspection requirements (i.e. inspection threshold, inspection method and inspection repeat interval) or other procedures (e.g. replacement/modification time) if inspections are shown to be impractical. The required data may be submitted all at once, prior to the airplane return to service, or it may be submitted in stages. The following three-stage approval process is available that involves incremental approval of engineering data to allow an airplane to return to service before all the engineering data previously described is submitted. The three stages are described as follows:

a. The first stage is approval of the static strength data and the schedule for submittal of the DT data. This approval is required prior to returning an airplane to service. The submittal of the DT data should generally occur prior to 12 months from when the airplane was returned to service.

b. The second stage is approval of the DT data. The DT data should be submitted in accordance with the schedule approved in the first stage. The DT data might only contain the threshold where inspections are required to begin as long as the operator can demonstrate that a process is in place to acquire the required inspection technique and interval before the threshold is reached. In this case the submittal and approval of the remaining DT data may be deferred to the third stage.

c. The third stage is approval of the DT data not submitted and approved in the second stage. This would typically involve the inspection method and the repeat intervals. This data would need to be submitted and approved prior to the inspection threshold being reached. Operation beyond the threshold would not be allowed unless the data is submitted and approval obtained.

APPENDIX 5. ASSESSMENT OF EXISTING REPAIRS

A DTI assessment process consists of the following steps:

a. Airplane Repair Survey. A survey will be used to identify existing repairs and repair configurations on fatigue critical structure and provide a means to categorize those repairs. The survey would apply to all affected airplanes, as defined in the implementation plan, in an operator's fleet using the process contained in the Compliance Document. The procedure to identify repairs that require DTE should be developed and documented in the Compliance Document using 14 CFR 25.571 and AC 25.571-1x (dependant on airplane certification level) together with additional guidance specific to repairs, such as:

(1) Size of the repair
(2) Repair configuration
  (a) SRM standards
  (b) Other
(3) Proximity to other repairs
(4) Potential affect on fatigue critical baseline structure
  (a) Inspectability (access and method)
  (b) Load distribution

b. Identification and Disposition of repairs requiring immediate action. Certain repairs may not meet minimum requirements based on its condition such as cracking, corrosion, dents, or inadequate design. Use the guidance provided in the Compliance Document to identify these repairs and once identified take appropriate corrective action. In some cases, modifications may need to be made before further flight. The operator should consider establishing a fleet campaign if such repairs may have been installed on other airplanes. Note: Additional FAA Certificate Maintenance Office (CMO) coordination and approval, or regulatory action may be required in these cases.

c. DTI Development. This includes the development of the appropriate maintenance plan for the repair under consideration. During this step determine the inspection method, threshold and repeat interval. Determine this information from existing guidance information as documented in the Compliance Document, or from the results of an individual damage tolerance evaluation performed in according to AC 25.571. Then determine the feasibility of an inspection program to maintain continued airworthiness. If the inspection program is practical, incorporate the DTI into the individual airplane maintenance program. If the inspection is either impractical or impossible, incorporate a replacement time for the repair into the individual airplane maintenance program. The three-stage approach discussed in Appendix 4 may be used if appropriate.

APPENDIX 6. REPAIRS TO REMOVABLE STRUCTURAL COMPONENTS

This Appendix provides guidance on handling DT data development and implementation for existing and new repairs to fatigue critical structure on removable structural components. In summary, the guidance covers:

- Methods of determining or assigning the age (hours/cycles) to a removable structural component when its original life history is unknown.
- Guidance on tracking of removable components that contain fatigue critical structure.
- Methods and schedules for developing and implementing DT data for repairs to removable components that contain fatigue critical structure.
- Implementation options for removable components that contain fatigue critical structure.

Other methods than those given below for determining the age of a component or tracking parts may be used if approved by the PMI as part of the Operator's Implementation Plan.

a. Determining the Age of a Component. Determining an actual component age or assigning a conservative age will provide flexibility and reduce operator burden when implementing DT data for repairs to structural components. In some cases, the actual component age may be determined from records. If the actual age cannot be determined this way, the component age may be conservatively assigned using one of the following fleet leader concepts depending upon the origin of the component:

(1) If part times are not available, but records indicate that <u>no</u> part changes have occurred, airplane cycles/hours can be used.

(2) If no records are available and the parts could have been switched from one or more older airplanes under the same maintenance program, it should be assumed that the time on any part is equal to the oldest airplane in the program. If this is unknown, the time should be assumed equal to the same model airplane that is the oldest or has the most hours/flight cycles in the world fleet.

(3) A manufacturing date marked on a component may also be used to establish the component's age. This can be done by using the above reasoning and comparing it to airplanes in the affected fleet with the same or older manufacturing date.

If none of these options can be used to determine or assign a component age or hours/cycles, a conservative implementation schedule can be applied in Paragraph c, below, for the initial inspection if required by the DT data.

b. Tracking. An effective, formal control or tracking system should be established for removable structural components that are subject to this rule. This will help ensure compliance with maintenance program requirements specific to repairs installed on an affected removable structural component. Paragraph d, below, does provide options that could be used to alleviate some of the burdens associated with tracking all repairs to affected removable structural components.

c. Developing and Implementing DT Data:

(1) Existing Repairs – Components Installed prior to December 20, 2010. Accomplish the initial repair assessment of the affected component at the same time as the airplane level survey for the airplane on which the component is installed (Step b, above). Develop the DT data per the process given in Step 3 of Appendix 5 and incorporate the DTI into the maintenance program. Accomplish the first inspection on the affected component according to the following schedule:

(a) If the actual repair installation age, hours/cycles is known, use that to accomplish the first inspection against the component. Repeat inspect at the intervals given for the repair.

(b) If the repair installation age, hours/cycles is unknown, but the component age, hours/cycles is known or can be assigned conservatively, use the component age, hours/cycles to accomplish the first inspection against the component. Repeat inspect at the intervals given for the repair against the component.

(c) As an option, accomplish the first inspection on the affected component at the next C-check (or equivalent interval) following the repair assessment. Repeat inspect at the intervals given for the repair against the component.

(2) Existing Repairs – Components Installed from Storage after December 20, 2010. For components installed from storage after December 20, 2010 that have not previously had DTE performed and DTI implemented, develop and implement DT data as follows:

(a) If the time on the component (hours/cycles) is known, or can be conservatively assigned, perform the following:

i Survey the component,

ii Disposition the repair(s)

iii Implement the DTI in accordance with the schedule given for an airplane in Chapter 207 b(1), using the component's age

iv Accomplish the first inspection using the actual repair age, hours/cycles if known. If the repair age is not known, use the component age. Repeat inspect at the intervals given for the repair against the component.

(b) If the time on the component, hours/cycles is unknown and cannot be assigned, accomplish the initial repair assessment of the affected component prior to installation.

i Develop the DT data per the process given in Chapter 207 b(1).

ii Incorporate the DTI into the maintenance program.

iii Accomplish the first inspection on the affected component at the next C-check (or equivalent interval) following the repair assessment.

iv Repeat inspect at the intervals given for the repair against the component.

(3) New Repairs. New repairs to fatigue critical structure on removable structural components installed beginning December 21, 2010, and thereafter, must have DTE performed and DTI implemented according to the process described in Appendix 4, "Approval Process for New Repairs". The initial and repeat inspections are accomplished at the intervals given for the repair against the component.

d. Implementation Options to Help Reduce Tracking Burden. The following implementation techniques could be used to alleviate some of the burdens associated with tracking repairs to affected removable structural components. These techniques, if used, would need to be included in the Operator's Implementation Plan(s) and may require additional FAA-ACO approval and DAH input for DTI.

(1) Upgrading Existing Repairs. As an option, existing repairs may be removed and replaced to zero time the DTI requirements of the repair and establish an initial tracking point for the repair. Normally, this would be done at or before the survey for maximum benefit. The initial and repeat inspections for the upgraded repair would then be accomplished at the intervals given for the repair against the component.

A repair could also be upgraded to one whose inspection requirements and methods are already fulfilled by an Operator's regular FAA-approved maintenance or inspection program (Section 302, Step d., Implementation Techniques). That repair would then be repetitively inspected at each routine inspection interval applicable to the repair. Specific tracking would not be required because that area of the airplane would already be normally inspected on each airplane in the fleet as part of the existing approved maintenance program. If the Operator's program intervals were changed, the affect on requirements for specific tracking would have to be re-evaluated.

(2) Special Initial and/or Routine Inspections. As an option, existing repairs may have special initial inspections accomplished during the survey to zero time the DTI requirements of the repair and establish an initial tracking point for the repair.

In addition, special routine inspections could be defined for typical repairs that could be applied at a normal interval. In this case, an operator could check the affected components on each aircraft for this type of a repair at the defined interval. If the repair were found, the special inspection would be applied to ensure its airworthiness until the next scheduled check. This would alleviate the need to specifically track affected components for every repair, especially typical ones.

The development of inspection processes, methods, applicability and intervals would most likely require the assistance of the DAH for the fatigue critical structure in question. In all circumstances, the data must be approved by the FAA-ACO.

APPENDIX 7. PROGRAM IMPLEMENTATION EXAMPLES

The following are provided to assist the operator in understanding how the program should be implemented. Two examples are given, one covers airplanes below 75% DSG on December 18, 2009, and the other is for airplanes beyond DSG on December 18, 2009.

a. Airplane Below 75% DSG on December 18, 2009

Consider the following:

(1) Airplane Total Cycles on December 18, 2010 – 55,000
(2) DSG = 75,000 Cycles, 75% DSG – 56,250 Cycles
(3) Time of last “D”-Check Equivalent – 53,000 Cycles
(4) 8 Year “D”- check Equivalent – 360 Days/Year, 4 cycles/day = 11,680 Cycles

The survey would be performed after the airplane reaches 56,250 cycles and would be due before 64,680 cycles, but in any case would be required before the airplane reached 75,000 cycles.

b. Airplane Beyond DSG on December 18, 2009

Consider an airplane that has accumulated 80,000 cycles as of December 18, 2009, a DSG of 75,000 cycles. The airplane is currently on an 8 year “D” check equivalent and the last “D”-check was performed in January 2009 at 78,540 cycles. The survey would need to be performed prior to the airplane accumulating 90,220 cycles or 6 years whichever occurs sooner, based on the airplane utilization of 4 cycles/day, a 360-day year, and a maximum accumulated cycles of 81,460 as of December 20, 2010.

Appendix C: AAWG Recommendations on AC 91-56B

U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

AAWG ANNOTATED VERSION – Includes AAWG Recommendations from ARAC Tasking Review

Subject: CONTINUING STRUCTURAL INTEGRITY PROGRAM FOR AIRPLANES	**Date: XX/XX/02** **Initiated By: ANM-115**	**AC No: 91-56B** **Change:**

1. PURPOSE. This Advisory Circular (AC) provides guidance material to type certificate holders (TCH) and operators for use in developing a continuing structural integrity program to ensure safe operation of older airplanes throughout their operational life.

2. CANCELLATION. AC 91-56A, Continuing Structural Integrity Program for Large Transport Category Airplanes dated April 29, 1998, is canceled.

3. RELATED REGULATIONS AND DOCUMENTS.

a. Title 14 of the Code of Federal Regulations (14 CFR):

(1) Part 25, § 25.571.

(2) Part 91, § 91.403.

(3) Part 43, § 43.16.

AAWG Changes Highlighted:
Additions shown in *Italics*
Deletions shown in ~~Strikethrough~~

(4) Part 121, §121.368, §121.370, and §121.370(a).

(5) Part 129, §129.16, §129.32, and §129.33.

b. Advisory Circulars (AC):

(1) AC 25.571-1, Damage Tolerance and Fatigue Evaluation of Structure.

(2) AC 91-60, The Continued Airworthiness of Older Airplanes.

(3) AC 120-73, Damage Tolerance Assessment of Repairs to Pressurized Fuselages.

(4) AC 120-AAWG, Damage Tolerance Inspections for Repairs.

4. DEFINITIONS. Terms included in this document are defined as follows:

a. Supplemental Structural Inspection Program (SSIP).

(1) This guidance material is traditionally applied to the eleven large transport airplane models (Airbus Model A300; British Aerospace BAC 1-11; Boeing Models B-707/720, B-727, B-737, B-747; McDonnell Douglas DC-8, DC-9/MD-80, DC-10; Fokker F28; and Lockheed Model L-1011 series 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 takeoff gross weight greater than 75,000 pounds operated under Subpart D of 14 CFR Parts 91, 121, and 125.

(2) The promulgation of the “Aging Airplane Safety” rule expanded the requirement for damage tolerance-based SSIPs beyond the above noted eleven models to include:

- All airplanes operated under Subpart D of 14 CFR Part 121;
- All U.S.-registered multiengine airplanes operated under 14 CFR Part 129 certificated with 10 or more passenger seats; and
- All multiengine airplanes used in scheduled operations under 14 CFR Part 135 certificated with 10 or more passenger seats.

(3) Guidance material for all U.S.-registered multiengine airplanes operated under Part 129 certificated with 9 or less passenger seats and all multiengine airplanes operated under Part 135 certificated with 9 or less passenger seats required by the “Aging Airplane Safety” rule to develop a service history based SSIPs is provided in AC 91-60.

b. Mandatory Modification Program. This guidance material is applicable to the eleven large transport airplane models (Airbus Model A300; British Aerospace BAC 1-11; Boeing Models B-707/720, B-727, B-737, B-747; McDonnell Douglas DC-8, DC-9/MD-80, DC-10; Fokker F28; and Lockheed Model L-1011 series airplanes) that are required by airworthiness directives to modify or replace aging structures with known cracking problems.

c. Corrosion Prevention and Control Program (CPCP). This guidance material is applicable to the airplanes that are required by airworthiness directives (AD) to maintain the corrosion on their airplanes to an acceptable level.

d. Repair Assessment Program. This guidance material is applicable to the eleven large transport airplane models (Airbus Model A300; British Aerospace BAC 1-11; Boeing Models B-707/720, B-727, B-737, B-747; McDonnell Douglas DC-8, DC-9/MD-80, DC-10; Fokker F28; and Lockheed Model L-1011 series airplanes) that are required by operational rules to incorporate repair assessment guidelines for the fuselage pressure boundary in their FAA-approved maintenance or inspection program.

NOTE: The "Evaluation for Widespread Fatigue Damage" will be mandated in a future rulemaking activity.

5. BACKGROUND.

a. 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 factors such 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.

b. The Federal Aviation Administration (FAA), TCH, and operators are continually working 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 airplanes indicate the need for a program to ensure a high level of structural integrity for all airplanes. Accordingly, the inspection and evaluation programs outlined in this AC are intended to ensure a continuing structural integrity assessment by each airplane TCH and the incorporation of the results of each assessment into the maintenance program of each operator.

6. SUPPLEMENTAL STRUCTURAL INSPECTION PROGRAMS.

a. Initiation and Implementation. The TCH, in conjunction with operators, is expected to initiate development of a SSIP 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.

b. Timeline to Begin Initiation. The SSIP should be accomplished in accordance with the timeline provided in the "Aging Airplane Safety" rule. 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 Structural Inspection Document (SSID) should be developed, as outlined in Appendix 1, from this body of data.

c. Submission of the SSID. 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 SSID and presented in a manner that is effective. The SSID should include:

(1) The type of damage being considered;

(2) Likely sites;

(3) Inspection access;

(4) Threshold;

(5) Interval;

(6) Method and procedures;

(7) Applicable modification status and/or life limitation; and

(8) Types of operations for which the SSID is valid.

d. FAA Review and SSID Acceptance. The FAA review of the SSID will include both engineering and maintenance aspects of the proposal. Since the SSID is applicable to all operators and is intended to address potential safety concerns on older airplanes, it will be made mandatory under the existing AD system or in accordance with the "Aging Airplane Safety" rule. In addition, any service bulletin or other service information publications found to be essential for safety during the initial SSID 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 SSID should be added to the SSID or implemented by separate AD action, as appropriate.

NOTE: In the event an acceptable SSID cannot be obtained on a timely basis, the FAA may impose service life, operational, or inspection limitations to ensure structural integrity.

e. SSID Revisions. The TCH should revise the SSID whenever additional information shows a need. The original SSID 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 SSID criteria and the basis for these revisions should be submitted to the FAA for review and approval of both engineering and maintenance aspects.

f. Baseline Structure Inspection Program. The operators will be expected to accomplish a damage tolerance based inspection program of all *alterations, modifications and repairs made to aircraft structure and STCs that is susceptible to fatigue cracking that could contribute to a catastrophic failure. This is to be done in accordance with the timelines established in the "Aging Airplane Safety" rule.* ~~major repairs, alterations, or modifications to baseline structure in accordance with the timelines established in the "Aging Airplane Safety" rule.~~ The baseline structure is defined as that airplane structure that was originally built by the TCH. The results must be presented to the cognizant Aircraft Certification Office for review and approval, with type certificate responsibility for the airplane model being considered. Traditionally, the ADs that have mandated SSIPs on older airplanes have addressed repairs, alterations, and modifications that affect principal structural elements (PSE) and the "Repair Assessment for Pressurized Fuselages" rule addressed repairs to the fuselage pressure boundary (fuselage skin, door skin, and bulkhead webs), but the "Aging Airplane Safety" rule requires that all *alterations, modifications and repairs made to aircraft structure and STCs that are susceptible to fatigue cracking that could contribute to catastrophic failure be considered.* ~~major repairs, alterations, and modifications to baseline structure be considered.~~

7. MANDATORY MODIFICATION PROGRAM.

a. 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:

- The likelihood that known structural cracking problems exist and are not just theoretical or predicted.

- The consequences of failing to correct the problem must be catastrophic. This means that the structural element involved must be a PSE or other primary structure.

- The cracks must be difficult to detect during regular maintenance.

- Other considerations are that the areas to inspect are difficult to access, nondestructive testing (NDT) methods are unsuitable, or human factors of inspection are so adverse that crack detection may not be sufficiently dependable to assure safety.

b. The structural modification programs were invoked 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 DC-8, DC-9/MD-80, DC-10; Fokker F28; and Lockheed Model L-1011 series airplanes) by ADs. Each of the TCHs reviewed their service bulletins with the FAA to determine which areas of structure needed terminating modifications to inspections. The revised service bulletins that included those terminating modifications were then grouped in a document and mandated, or the service bulletin was mandated individually.

c. *The Aging Airplane Safety Final Rule requires that all modifications that are susceptible to fatigue cracking that could contribute to a catastrophic failure be considered.*

8. CORROSION PREVENTION AND CONTROL PROGRAM (CPCP). A CPCP is a systematic approach to controlling corrosion in the airplane's primary structure and consists of a basic corrosion inspection task, task areas, defined corrosion levels, and compliance times. The objective of a CPCP is to limit the material loss due to corrosion to a level necessary to maintain airworthiness.

a. The CPCPs were mandated by ADs 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 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 an AD. These corrosion programs supplemented each operator's maintenance program.

b. The corrosion programs were developed based on the premise that operators could 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.

c. *Include a new paragraph that stipulates industry standard practices since CPCP rulemaking withdrawn (TBD).* ~~The FAA is considering additional rulemaking to require that maintenance or inspection programs for all airplanes operated under Part 121, all U.S.-registered multiengine airplanes operated in common carriage by foreign air carriers or foreign persons under Part 129 and all multiengine airplanes used in scheduled operations operated under Part 135 include an FAA-approved CPCP. This Notice of Proposed Rulemaking (NPRM) would give operators two years to implement a CPCP into their maintenance or inspection program. This NPRM would be issued in response to the Aging Airplane Safety Act of 1991.~~

9. REPAIR ASSESSMENT PROGRAM. The industry was given the task 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 repairs do not deteriorate due to accidental, fatigue, or environmental damage beyond FAA-approved levels for the remaining usage life of the airplane.

a. On January 2, 1998, an NPRM, Repair Assessment for Pressurized Fuselages, was published in the Federal Register. The proposed rule would prohibit 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 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. This rulemaking ensures that a comprehensive damage tolerance repair assessment be completed for fuselage pressure boundary repairs.

b. The final rule was published in the Federal Register on April 25, 2000 and became effective May 25, 2000. As a result of this final rule the new operating rules are Part 91, § 91.410, Part 121, § 121.370, Part 125, § 125.248, and Part 129, § 129.32. AC 120-73 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.

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 that are 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 SSID 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. SSIDs for the above noted aging aircraft models and those derivatives that were not certified to the damage tolerance requirements will still continue to be mandated by airworthiness directives. SSIDs for the other airplanes will be incorporated in accordance with the “Aging Airplane Safety” rule and will not require airworthiness directives. ADs issued as a result of a WFD finding that require structural modification would be handled separately. In all cases, compliance will be required in accordance with the applicable regulations.

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

APPENDIX 1

GUIDELINES FOR DEVELOPMENT OF THE SUPPLEMENTAL STRUCTURAL INSPECTION DOCUMENT

1. GENERAL.

a. The airplanes subject to this appendix 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 Title 14 of the Code of Federal Regulations (14 CFR) Part 25, § 25.571. An acceptable means of compliance can be found in the current version of AC 25.571-1, Damage Tolerance and Fatigue Evaluation of Structure.

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, alterations and modifications approved by the TCH and made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, should be considered.* ~~major repairs, alterations and modifications approved by the TCH should be considered.~~ In addition, it will be necessary to consider the effect of all *repairs and operator or STC-approved alterations and modifications on individual airplanes, which are made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.* ~~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. 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 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: If an inspection procedure is not reliable or practicable, then replacement or modification of the structure 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 (SSID) 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 SSID, 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 SSID (added as revision to the initial SSID);

(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; and

(12) Information related to any variations found necessary to “safe lives” already declared.

c. The SSID 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 SSID.

6. STRUCTURAL REPAIRS, ALTERATIONS AND MODIFICATIONS

a. Operators are responsible for ensuring that an assessment is made of all *repairs, alterations and modifications (e.g. STCs) to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure,* ~~major repairs, alterations and modifications (e.g., STCs) to baseline structure~~ to develop a damage tolerance based inspection program that ensures the same confidence as the baseline structure. The baseline structure is defined as that airplane structure that was originally built by the TCH. The operator will need to conduct an assessment on each of their airplanes to determine what repairs, alterations and modifications are applicable for a damage tolerance assessment.

b. Reliance on the operator's baseline maintenance program may be critical elements of the TCH evaluation to develop the SSID. *Repairs, alterations and modifications made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure,* ~~Major repairs, alterations and modifications~~ may invalidate these maintenance programs and would require additional analysis and/or testing.

c. Operators must accomplish a damage tolerance assessment for all new repairs, alterations and modifications to *aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.* ~~baseline structure.~~

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, Title 14 of the Code of Federal Regulations (14 CFR) Part 25, § 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 WFD. 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.

Appendix D: ARAC Recommendations on WFD

The following Draft NPRM was submitted to ARAC on May 23, 2001, and represents the AAWG recommendations for rulemaking on the subject of WFD.

[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 enrooted 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:

- *Multiple site damage (MSD) 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).*
- *Multiple element damage (MED) 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*

__NOTE__: 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 Federal Register.

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.*

2. *Because of the instances of MSD/MED in the fleet and the continued reliance on surveillance types of inspections to discover such damage, develop rules and advisory material that will provide specific programs, including a structural audit, to preclude WFD in the fleet.*

3. *Implement an effective aging airplane program, including a Mandatory Modifications Program, Corrosion Prevention and Control Program (CPCP), Repair Assessment Program (RAP), and a Supplemental Structural Inspection Program (SSIP) or Airworthiness Limitations Section (ALS) as a necessary prerequisite for effective program to address MSD/MED.*

4. *Use a monitoring period for the management of potential MSD/MED scenarios in the fleet, if the structural audit determines that MSD/MED cracking is detectable before the structure loses its required residual strength.*

5. Carefully consider any program established to correct MSD or MED in the fleet to ensure that the necessary lead times to develop resources to implement fleet action are addressed. For example, operators need time to assess their fleet and accomplish a structural audit of repaired, altered or modified structure that is susceptible to MSD or MED.

The FAA tasked the Technical Oversight Group re: Aging Aircraft (TOGAA) to review and comment on the WFD Report. TOGAA endorsed the AAWG methodology on January 10, 2000.

In December 1999, a new task was assigned to ARAC entitled "Task 6: Aging Aircraft Program (Widespread Fatigue Damage - WFD)." In the tasking, the FAA requested that ARAC develop recommendations for operating rules and a revision to § 25.1529, Appendix H, to implement an aging aircraft program that would include a program to preclude WFD from the fleet. ARAC assigned this task to the AAWG. This proposed rule and proposed AC 91-56B (discussed later) are based on the recommendations submitted by ARAC to the FAA in response to this tasking.

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 Final 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 that 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. <u>Corrosion Prevention and Control Programs (CPCP)</u>: 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. <u>Repair Assessment Program</u>: 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. <u>Mandatory Modifications Program:</u> 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:

<u>Operational Rule 1 – Basis of Structural Maintenance Program</u>

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. <u>Acceptable mandatory modifications programs</u> 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. <u>An acceptable CPCP</u> 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, and 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. <u>An acceptable SSIP</u> 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. <u>An acceptable RAP</u> 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 Final 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 would 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.

Second, 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 include 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 fatigue critical 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 inspect able using visual means to being unimpeachable. 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.

<u>Benefits</u>

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 fatigue critical 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. <u>Accident-Related Benefits</u>: 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 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 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 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 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 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 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

Appendix E: AAWG Recommendations to TAEIG Concerning Proposed Follow-on Task 2, 3 and 4 Activities

The following is a proposal for the follow activities that were defined in the report.

Background:

In the Federal Register / Vol. 69, No. 93 / Thursday, May 13, 2004 / Notices Aviation Rulemaking Advisory Committee; Transport Airplane and Engine Issues—New Task, Page 26641, The FAA assigned ARAC a new task to develop guidance that will support industry compliance with the Aging Airplane Safety Final Rule requirements that relate to supplemental structural inspections. ARAC assigned this tasking to the Airworthiness Assurance Working Group (AAWG). In Task 2 and 3 of the subject tasking, the AAWG was to write a report to include a proposed action plan for addressing recommendations from Tasks 2 and 3 (the best means to incorporate damage tolerance based inspections and procedures for alterations and modifications and developing widespread fatigue damage maintenance requirements for repairs, alterations and modifications). The report was to include a proposed action plan to address or accomplish these recommendations. This action plan would be submitted to the TAEIG who would determine, as appropriate, the means by which the action plan be implemented. In addition, the AAWG will support the 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. The AAWG is also responsible for the oversight of the STG activities for development of the compliance data according to AC 120-AAWG as amended by any follow-on guidance material from this Tasking.

Task 4 is a combination of follow-on activities from Task 2 and 3 combined with the specific Task 4 activities.

Task 2 Proposed Action Plan for Follow-on Activities– Damage Tolerance Based Inspections And Procedures For Alterations And Modifications.

The AAWG determined that additional specific guidance material was necessary for the industry to uniformly develop DT data for previously installed Alterations and Modifications. Specifics of that recommendation are included in Section 3 of this report. The AAWG requests that the TAEIG task the following to the AAWG:

1. The AAWG will prepare and submit guidance materials for consideration of alterations and modifications to the TAEIG within six months of TAEIG acceptance of the written report.
2. Upon TAEIG acceptance of the AAWG guidance material, the AAWG will recommend that Model Specific STGs invite STC DAH and involve them in the dialog to ensure that DT data is in existence on December 18, 2009 for all commonly embodied STCs in concert with Task 4 of the original tasking.

Task 3 Proposed Action Plan – Widespread Fatigue Damage of Repairs Alterations and Modifications

The AAWG determined that additional specific guidance material was necessary for the industry to uniformly develop WFD data for previously installed Repairs, Alterations and Modifications. Specifics of that recommendation are included in Section 4 of this report. The AAWG requests that the TAEIG task the following to the AAWG:

The AAWG will develop and provide additional guidance data for the development of WFD data for repairs and provide it to ARAC within 6 months of TAEIG acceptance of this proposal. The AAWG will then establish a group of technical experts that will develop the required technical basis for the guidance material. They will then develop that material for inclusion in either FAA Advisory Circular 120-AAWG or another yet to be determined AC. This guidance material should include:

1. Screening process to identify significant repairs, alterations, and modifications. The guidance material should contain a means to screen repairs, alterations, and modifications to determine which ones would be of a potential concern for development of WFD.
2. Invitation to significant STC holders to participate in the STG. An invitation should be extended to those DAHs who hold the certification data for repairs, alterations, and modifications identified in step one. Their participation in the STG will be of great assistance in developing the required data.
3. Developing means to acquire data for significant repairs, alterations, and modifications where the DAHs are not in a position to supply the data. There will be some repairs, alterations, and modifications where the DAH is unavailable to develop the data. The STG should develop a plan whereby the data is developed.
4. There may be other actions that could be considered to assist the operators in developing the data.

TASK 4 PROPOSED ACTION PLAN – MODEL SPECIFIC PROGRAMS

The following actions will be taken by the AAWG upon acceptance of the findings of this report by TAEIG.

1. The AAWG will list the STGs currently in existence and will identify those airplane models that do not have an STG

2. Assess the need to form an STG on a model specific basis (based on industry benefit).

3. 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.

4. The AAWG will support the 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.

Schedule

All recommendations for additional guidance material under Task 2 and 3 must be complete and submitted to ARAC no later than six months after TAEIG Acceptance of the findings in this report.

The Structures Task Groups, under the direction of the ARAC, should produce the model specific guidance material, Task 4, using the guidelines and procedures of the AC produced in Phase 1. The ARAC will be responsible for coordinating and overseeing the STG's application of the AC. Phase 2 documents should be completed by December 18, 2009.

Working Group Activity

The Airworthiness Assurance Working Group must comply with the procedures adopted by ARAC. This normally requires the following elements:

1. Recommend a work plan for completion of the task, including the rationale supporting such a plan for consideration at the next meeting of the ARAC on transport airplane and engine issues held following publication of this notice.

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

3. Draft the appropriate documents and required analyses and/or any other related materials or documents.

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

Whereas this is an oversight activity, items 1, 2 and 3 will not be required. However status reports on the progress of the STGs in developing compliance documents and data will be required at each meeting of the ARAC held to consider transport airplane and engine issues.

Appendix F: AAWG Meetings and Attendance Records

1. Meeting Dates and Venues

AAWG Meetings

July 23, 2003	--	Atlanta Georgia (Delta Air Lines)
June 30, 2004	--	Long Beach CA (FAA)
March 1, 2005	--	Miami FL (Airbus)
October 26, 2005	--	Memphis TN (FedEx)

Task Group Meetings

Ad-hoc Task Planning Group

September 15-17, 2003	–	Seattle Washington (Boeing)
November 11-14, 2003	–	London England (British Airways)
March 29-April 2, 2004	–	Toulouse France (Airbus)
May 17-21, 2004	–	Memphis Tennessee (FedEx)

Task Group Meetings

July 12-16, 2004	–	Gatwick England (CAA-UK)
September 20-21, 2004	–	Long Beach (Boeing)
November 15-19, 2004	–	Brussels Belgium (FAA)
January 31- Feb 4, 2005	–	Miami FL (Airbus)
March 14-18, 2005	–	Hamburg GE (Airbus)
May 2-6, 2005	–	Long Beach CA (FAA/Boeing)
June 13-19, 2005	–	Collioure FR (Airbus)
September 26-30, 2005	–	Seattle WA (Boeing)

2. **AAWG Organizational Meeting Attendance**

	MEETING DATE			
Organization	**July 2003**	**June 2004**	**March 2005**	**October 2005**
Airborne Express (M)	X	X	X	X
Airbus (M)	X	X	X	X
ALPA				
America West				
American Airlines (M)	X	X		X
ATA (M)				X
Boeing (M)	X	X	X	X
British Aerospace (M)	X			
British Airways (M)	X	X		X
CAA-UK(JAA) (M)	X			
Continental Airlines (M)	X	X	X	X
Delta Air Lines (M)	X	X		
Evergreen Aviation				
FAA (M)	X	X	X	X
Federal Express (M)	X	X	X	X
Fokker Services				
IATA				
Japan Air Lines		X		
Lockheed (M)	X			
Northwest Airlines (M)		X	X	X
SIE		X		
TIMCO		X		
United Airlines (M)	X	X	X	
UPS (M)	X	X	X	X
US Airways (M)	X	X		X

(M) – AAWG Voting Member

3. AAWG Task Planning Group Organizational Attendance

	MEETING DATES			
Organization	**Sep 2003**	**Nov 2003**	**Mar 2004**	**May 2004**
Airborne Express	X	X		X
Airbus	X	X	X	X
American Airlines	X	X	X	X
ATA				
Boeing	X	X	X	X
British Airways	X	X	X	X
Continental Air Lines	X	X	X	X
Delta Air Lines	X	X	X	X
EASA		X	X	
FAA	X	X	X	X
Federal Express	X	X		X
Gulfstream		X	X	
Japan Air Lines	X	X	X	X
Lockheed			X	X
Northwest Airlines	X	X	X	X
SIE				
TIMCO				
United Airlines	X			
UPS	X	X		X
US Airways	X	X	X	X

4. AAWG Task Group Organizational Attendance

	MEETING NUMBER							
Organization	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Airborne Express		X		X		X		
Airbus	X	X	X	X	X	X	X	X
American Airlines	X		X	X	X	X	X	
ATA								
Boeing	X	X	X	X	X	X	X	X
British Airways	X	X	X	X	X		X	X
Continental Air Lines								
Delta Air Lines	X	X						
EASA	X	X	X	X				
FAA	X	X	X	X	X	X	X	X
Federal Express	X	X	X	X		X	X	X
Gulfstream								
Japan Air Lines	X	X		X				X
Lockheed								
Northwest Airlines	X	X	X	X	X	X	X	X
SIE						X		
TIMCO								
Transport Canada								X
United Airlines								
UPS	X	X	X	X	X	X	X	X
US Airways	X	X						

No.	Date	Venue
1	July 12-16, 2004	Gatwick England (CAA-UK)
2	September 20-21, 2004	Long Beach (Boeing)
3	November 15-19, 2004	Brussels Belgium (FAA)
4	January 31- Feb 4, 2005	Miami FL (Airbus)
5	March 14-18, 2005	Hamburg GE (Airbus)
6	May 2-6, 2005	Long Beach CA (FAA/Boeing)
7	June 13-19, 2005	Collioure FR (Airbus)
8	September 26-30,2005	Seattle WA (Boeing)

U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: CONTINUING STRUCTURAL INTEGRITY PROGRAM FOR LARGE TRANSPORT CATEGORY AIRPLANES	**Date:** 5/23/01	**AC No:** 91-56BX
	Initiated by: ANM-110	**Change:** DRAFT 5

1. PURPOSE.

a. This Advisory Circular (AC) describes an acceptable means for showing compliance with various requirements of Title 14, Code of Federal Regulations, that concern establishing a program to address widespread fatigue damage (WFD) in transport category airplanes. This AC provides guidance to type certificate holders 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, including provision to preclude WFD. This guidance material applies to large transport airplanes that:

- were certificated under the fail-safe and fatigue requirements of Civil Air Regulations (CAR) 4b or 14 CFR part 25 (except for the "Supplemental Inspection Program" which is applicable to airplanes certified to pre-amendment 25-45);
- have a maximum gross takeoff weight greater than 75,000 pounds; and
- are operated under 14 CFR parts 91, 121, 125, 129, or 135.

b. The means of compliance described in this document provides guidance to supplement the engineering and operational judgment that must form the basis of any compliance findings relative to continuing structural integrity programs for large transport category airplanes

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

d. Like all advisory circular material, this AC is not, in itself, mandatory, and does not constitute a regulation. It describes an acceptable means, but not the only means, for showing compliance with the requirements for transport category airplanes. Terms such as "shall" and "must" are used only in the sense of ensuring applicability of this particular method of compliance when the acceptable method of compliance described in this document is used. While these guidelines are not mandatory, they are derived from extensive Federal Aviation Administration and industry experience in determining compliance with the relevant regulations.

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

2. CANCELLATION. Advisory Circular (AC) 91-56A, Continuing Structural Integrity Program for Large Transport Category Airplanes, dated April 29, 1998, is canceled.

3. RELATED REGULATIONS AND DOCUMENTS.

a. **Title 14, Code of Federal Regulations (CFR):**

§ 25.571	Damage-tolerance and fatigue evaluation of structure
§ 25.903	Engines
§ 25.1529	Instructions for Continued Airworthiness
§ 43.16	Airworthiness Limitations
§ 91.403	Maintenance, Preventive Maintenance, and Alterations - General

b. **FAA Advisory Circulars (AC)**

AC 91-60" "	The Continued Airworthiness of Older Airplanes, dated June 13, 1983.
AC 20-128A"	Design Considerations for Minimizing Hazards Caused by Uncontained Turbine Engine and Auxiliary Power Unit Rotor Failure", dated March 25, 1997.

c. **Related Documents**

"Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Airplane Fleet," Revision A, dated June 29, 1999 [A report of the Airworthiness Assurance Working Group for the Aviation Rulemaking Advisory Committee Transport Aircraft and Engine Issues.]

4. BACKGROUND.

a. Service experience has shown there is a need to have continuing updated knowledge on the structural integrity of transport airplanes, especially as they became older. The structural integrity of these airplanes is of concern because such factors as fatigue cracking and corrosion are time-dependent, and our knowledge about them can best be assessed based on real-time operational experience and the use of the most modern tools of analysis and testing.

b. The Federal Aviation Administration (FAA), type certificate holders, and operators have continually worked to maintain the structural integrity of older airplanes. Traditionally, this has been carried out 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 use, 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 AC 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.

5. DEFINITIONS AND ACRONYMS.

a. For the purposes of this AC, the following definitions apply:

(1) **Damage-tolerance** is the attribute of the structure that permits it to retain its required residual strength without detrimental structural deformation for a period of use after the structure has sustained a given level of fatigue, corrosion, and accidental or discrete source damage.

(2) **Design Service Goal (DSG)** is the period of time (in flight cycles/hours) established at design and/or certification during which the principal structure will be reasonably free from significant cracking including widespread fatigue damage.

(3) **Extended Service Goal (ESG)** is an adjustment to the design service goal established by service experience, analysis, and/or test during which the principal structure will be reasonably free from significant cracking including widespread fatigue damage.

(4) **Principal Structural Element (PSE)** is an element that contributes significantly to the carrying of flight, ground or pressurization loads, and whose integrity is essential in maintaining the overall structural integrity of the airplane.

(5) **Widespread Fatigue Damage (WFD)** in a structure 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 (i.e., to maintain its required residual strength after partial structural failure).

(6) **Multiple Site Damage (MSD)** is a source of widespread fatigue damage characterized by the simultaneous presence of fatigue cracks in the same structural element (i.e., fatigue cracks that may coalesce with or without other damage leading to a loss of required residual strength).

(7) **Multiple Element Damage (MED)** is a source of widespread fatigue damage characterized by the simultaneous presence of fatigue cracks in similar adjacent structural elements.

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

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
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
LOV	Limit of Validity
LDC	Large Damage Capability
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

SMP	Structural Modification Point
SSID	Supplemental Structural Inspection Document
SSIP	Supplemental Structural Inspection Program

6. <u>SUPPLEMENTAL STRUCTURAL INSPECTION PROGRAMS</u>. The type certificate holder (TCH), in conjunction with operators, is expected to initiate the development of a Supplemental Structural Inspection Program (SSIP) 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 Structural Inspection Document (SSID) should be developed, as outlined in Appendix 1 of this AC, from this body of data.

a. The recommended SSIP, 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 SSIP should be adequately defined in the SSID. The SSID 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 SSID is valid.

b. The FAA's review of the SSID will include both engineering and maintenance aspects of the proposal. Because the SSID is applicable to all operators and is intended to address potential safety concerns on older airplanes, the FAA will make it mandatory under the existing Airworthiness Directive (AD) system. In addition, the FAA will issue AD's to implement any service bulletins or other service information publications found to be essential for safety during the initial SSID assessment process. Service bulletins or other service information publications revised or issued as a result of in-service findings resulting from implementation of the SSID should be added to the SSID or will be implemented by separate AD action, as appropriate.

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

d. The TCH should revise the SSID whenever additional information shows a need. The original SSID 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 SSID criteria and the basis for these revisions should be submitted to the FAA for review and approval of both engineering and maintenance aspects.

7. MANDATORY MODIFICATION PROGRAM. [*Reserved*]

8. CORROSION PREVENTION AND CONTROL PROGRAM (CPCP). [*Reserved*]

9. REPAIR ASSESSMENT PROGRAM (RAP). [*Reserved*]

10. EVALUATION FOR WIDESPREAD FATIGUE DAMAGE.

a. The likelihood of the occurrence of fatigue damage in an airplane's structure increases with airplane usage. The design process generally establishes a design service goal (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. The SSIP described in paragraph 6. and Appendix 1 of this AC are intended to find this form of damage before it becomes critical.

b. 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 effect on the large damage capability (LDC) before the cracks become detectable. The development of cracks at multiple locations (both MSD and MED) may also 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.

c. The TCH, in conjunction with operators, and in some cases the operators themselves are expected to initiate development of a maintenance program with the intent of precluding operation with 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 when needed, development of the program should be initiated no later than the time when the highest-time or highest-cycle airplane in the fleet reaches three quarters of its DSG or the extended service goal (ESG).

d. The results of the WFD evaluation should be presented for review and approval to the cognizant FAA Aircraft Certification Office having type certificate responsibility for the airplane model being considered. Since the objective of this evaluation is to preclude WFD from the fleet, it is expected that the results will include recommendations for necessary inspections or modification and/or replacement of structure, as appropriate. It is expected that the TCH will work closely with operators in the development of these programs to assure that the expertise and resources are available when implemented.

e. The FAA's review of the WFD evaluation results will include both engineering and maintenance aspects of the proposal. Since WFD is a safety concern for all operators of older airplanes, identified inspection or modification and/or replacement programs are proposed to be made mandatory by operational rules applicable to 14 CFR parts 91, 121, 125, 129, and 135. 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.

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

g. It is expected that the original recommended actions stemming from a WFD evaluation will be focused on those structural items that are soon expected to reach a point at which MSD/MED is predicted to occur. As the fleet ages, more areas of the airplane may reach the life at which MSD/MED is predicted to occur in those details, and the recommended service 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.

h. Operators will be expected to accomplish a WFD evaluation of applicable modified, repaired, or altered structure. The results must be presented for review and approval to the cognizant FAA Aircraft Certification Office having type certificate responsibility for the airplane model being considered.

11. IMPLEMENTATION. Once the FAA issues a SSID AD, operators must amend their current structural inspection programs to comply with and account for the applicable AD. The program to preclude WFD in the fleet has been mandated by operational rules, which require operators to amend the current structural maintenance programs. Any AD's 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.

DRAFT

Manager, Transport Airplane Directorate
Aircraft Certification Service

APPENDIX 1

GUIDELINES FOR DEVELOPMENT OF THE SUPPLEMENTAL STRUCTURAL INSPECTION DOCUMENT

1. GENERAL.

a. This appendix to AC 91-56B applies to transport category airplanes that were certificated prior to amendment 25-45 of 14 CFR part 25. That amendment introduced § 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. An acceptable means of compliance can be found in AC 25.571-1C ("Damage-Tolerance and Fatigue Evaluation of Structure," dated April 29, 1998) or the latest revision.

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, if 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 non-destructive techniques, and the inspection of individual airplanes, involving partial or complete dismantling ("teardown") 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 determination should be based on study of 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 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 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 3.a., above, the following should be included for each critical part or component:

(1) the basis used 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, 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 2.c. The size of damage that 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 4.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 1.c. 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 4.c.(1), above, would apply.

5. THE SUPPLEMENTAL STRUCTURAL INSPECTION DOCUMENT.

a. The SSID 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 SSID, 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 SSID (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 SSID should be compared 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 SSID. Future structural service bulletins should state their effect on the SSID.

APPENDIX 2

GUIDELINES FOR THE DEVELOPMENT OF A PROGRAM TO PRECLUDE THE OCCURRENCE OF WIDESPREAD FATIGUE DAMAGE

1. DEFINITIONS

a. WFD (average behavior) is the point in time when 50% of the fleet is expected to reach WFD for a particular detail.

b. Inspection Start Point (ISP) is the point in time when special inspections of the fleet are initiated due to a specific probability of having a MSD/MED condition.

c. Structural Modification Point (SMP) is a point reduced from the WFD average behavior (i.e., lower bound), so that operation up to that point provides equivalent protection to that of a two-lifetime fatigue test. No airplane may be operated beyond the SMP without modification or part replacement.

d. Teardown is the destructive inspection of structure, using visual and non-destructive inspection technology, to characterize the extent of damage within a structure with regard to corrosion, fatigue, and accidental damage.

e. Large Damage Capability (LDC) is the ability of the structure to sustain damage visually detectable under an operator's normal maintenance that is caused by accidental damage, fatigue damage, and environmental degradation, and still maintain limit load capability with MSD to the extent expected at SMP.

f. Scatter Factor is a life reduction factor used in the interpretation of fatigue analysis and fatigue test results.

g. Test-to-Structure Factor is a series of factors used to adjust test results to full-scale structure. These factors could include, but are not limited to, differences in:

- stress spectrum,
- boundary conditions,
- specimen configuration,
- material differences,
- geometric considerations, and

- environmental effects.

2. GENERAL.

a. The likelihood of the occurrence of fatigue damage in an airplane's structure increases with airplane usage. The design process generally establishes a design service goal (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.

b. With extended usage, uniformly loaded structure may develop cracks in adjacent fastener holes, or in adjacent similar structural details. These cracks may or may not interact, and they can have an adverse effect on the large damage capability (LDC) of the structure before the cracks become detectable. The development of cracks at multiple locations (both MSD and MED) may also 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 the time of certification.

c. 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.

d. There is a distinct possibility that there could be a simultaneous occurrence of MSD and MED in a given structural area. This situation is possible on some details that were equally stressed. If this is possible, then this scenario should be considered in developing appropriate service actions for structural areas.

e. 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, Corrosion Prevention and Control Program, Supplemental Structural Inspection Program and Repair Assessment Program.

f. There are alternative methods for accomplishing a WFD assessment other than that given in this AC. For example, AC 25-571-1C Paragraph 6.C(4) or latest revision contains guidance material for the evaluation of structure using risk analysis techniques.

3. STRUCTURAL EVALUATION FOR WFD.

a. **General**. The evaluation has three objectives:

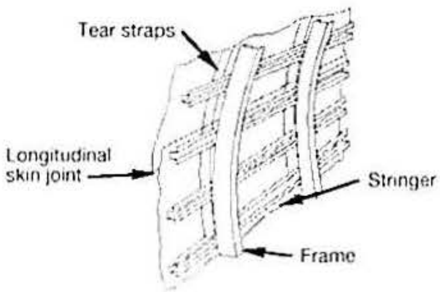
(1) Identify primary structure susceptible to MSD/MED (see paragraph 3.b of this appendix).

(2) Predict when it is likely to occur (see paragraph 3.c. of this appendix).

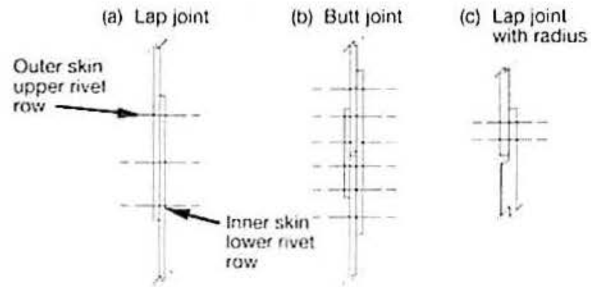
(3) Establish additional maintenance actions, as necessary, to ensure continued safe operation of the airplane (see paragraph 3.d. of this appendix).

b. **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. The following list contains known types of structure susceptible to MSD/MED:

STRUCTURAL AREA	SEE FIGURE
Longitudinal Skin Joints, Frames, and Tear Straps (MSD/MED)	A2-1
Circumferential Joints and Stringers (MSD/MED)	A2-2
Lap joints with Milled, Chem-milled or Bonded Radius (MSD)	A2-3
Fuselage Frames (MED)	A2-4
Stringer to Frame Attachments (MED)	A2-5
Shear Clip End Fasteners on Shear Tied Fuselage Frames (MSD/MED)	A2-6
Aft Pressure Dome Outer Ring and Dome Web Splices (MSD/MED)	A2-7
Skin Splice at Aft Pressure Bulkhead (MSD)	A2-8
Abrupt Changes in Web or Skin Thickness — Pressurized or Unpressurized Structure (MSD/MED)	A2-9
Window Surround Structure (MSD, MED)	A2-10
Over Wing Fuselage Attachments (MED)	A2-11
Latches and Hinges of Non-plug Doors (MSD/MED)	A2-12

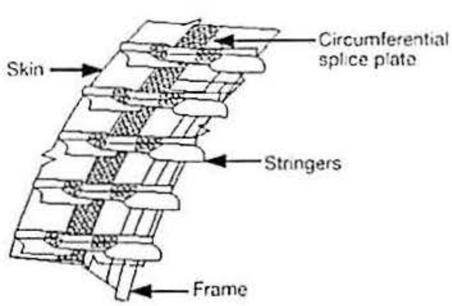


Type and possible location of MSD and MED
- MSD longitudinal skin joint
  - Lap joint
    - Outer skin upper rivet row
    - Inner skin lower rivet row
  - Butt joint
    - Skin outer rivet rows
    - Doubler inner rivet rows
  - Lap joint with radius
    - In radius
- MED—frame
  - Stress concentration areas
- MED—tear straps
  - Critical fastener rows in the skin at tear strap joint

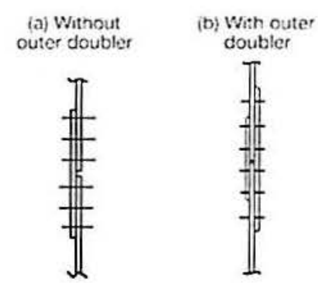


Service or test experience of factors that influence MSD and MED (examples)
- High stress—misuse of data from coupon test
- Corrosion
- Disbond
- Manufacturing defect
  - Surface preparation
  - Bond laminate too thin
  - Countersink, fastener fit
- Design defect—surface preparation process

Figure A2-1 ***Longitudinal Skin Joints, Frames, and Tear Straps (MSD/MED)***

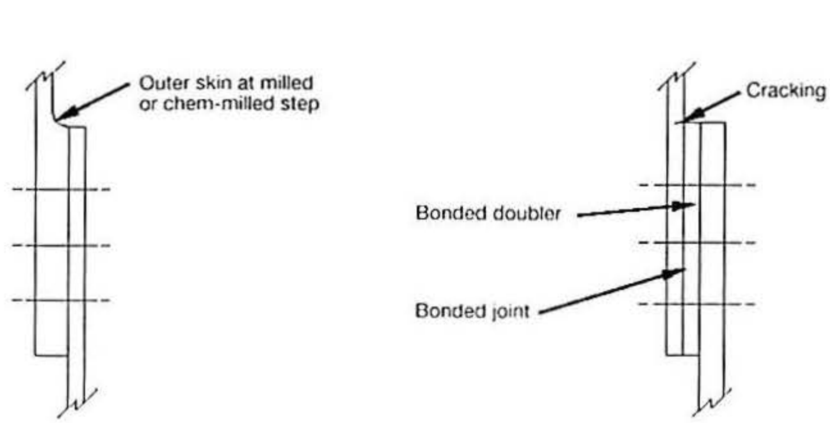


Type and possible location of MSD/MED
- MSD—circumferential joint
  - Without outer doubler
    - Splice plate—between and/or at the inner two rivet rows
    - Skin—forward and aft rivet row of splice plate
    - Skin—at first fastener of stringer coupling
  - With outer doubler
    - Skin—outer rivet rows
    - Splice plate/outer doubler—inner rivet rows
  - MED—stringer/stringer couplings
    - Stringer—at first fastener of stringer coupling
    - Stringer coupling—in splice plate area



Service or test experience of factors that influence MSD and/or MED (examples)
- High secondary bending
- High stress level in splice plate and joining stringers (misuse of data from coupon test)
- Poor design (wrong material)
- Underdesign (over-estimation of interference fit fasteners)

Figure A2-2 ***Circumferential Joints and Stringers (MSD/MED)***



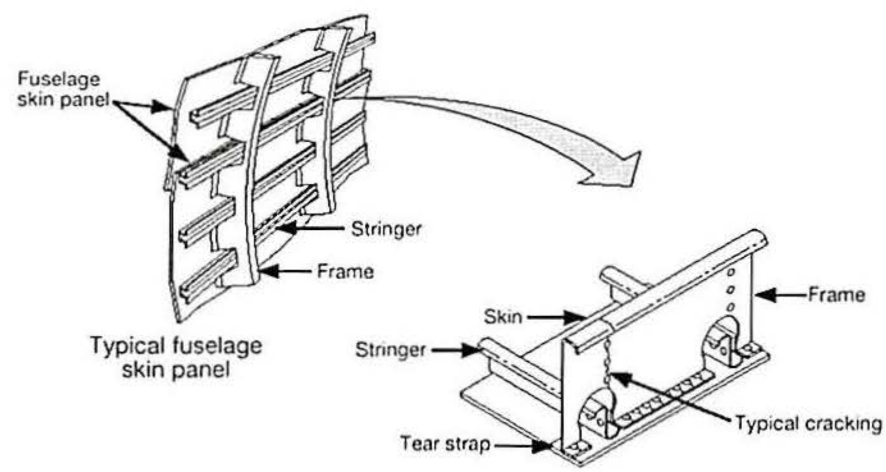
Type and possible location of MSD and MED

- MSD—abrupt cross section change
- Milled radius
- Chem-milled radius
- Bonded doubler runout

Service or test experience of factors that influence MSD and MED (examples)

- High bending stresses due to eccentricity

Figure A2-3 ***Lap joints with Milled, Chem-milled or Bonded Radius (MSD)***



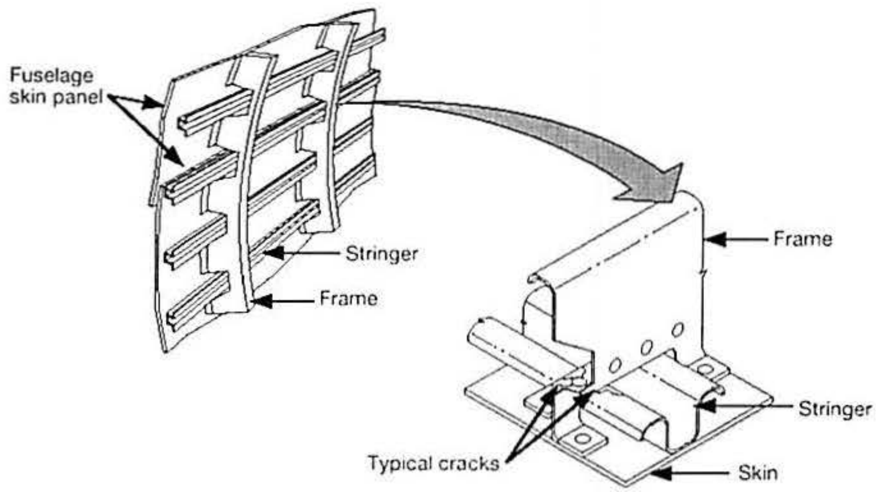
Type and possible location of MSD/MED

- 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

Figure A2-4 ***Fuselage Frames (MED)***



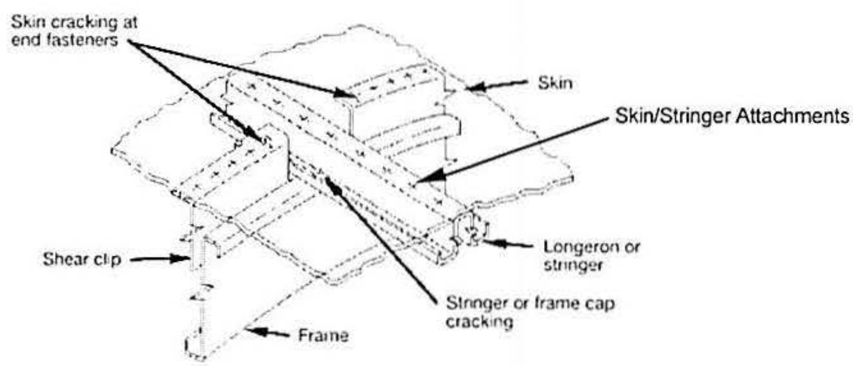
Type and possible location of MED

- MED—any combination of fracture of frames, clips, or stringers, including the attachments, resulting in the loss of the shear tie between the frame and stringer. This condition may occur at either circumferential or longitudinal locations at fuselage frame/stringer intersection.

Service or test experience of factors that influence MSD and/or MED (examples)

- Poor load path connection

Figure A2-5 ***Stringer to Frame Attachments (MED)***



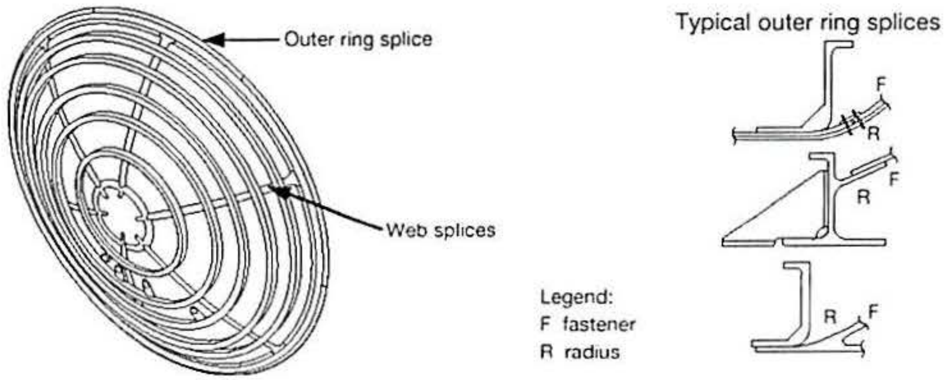
Type and possible location of MSD and MED

- 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

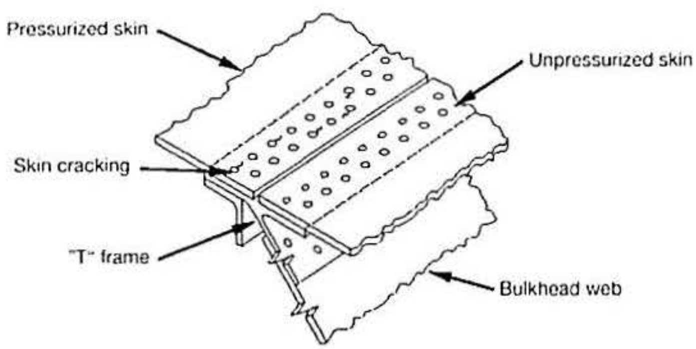
Figure A2-6 ***Shear Clip End Fasteners on Shear Tied Fuselage Frame (MSD/MED)***



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

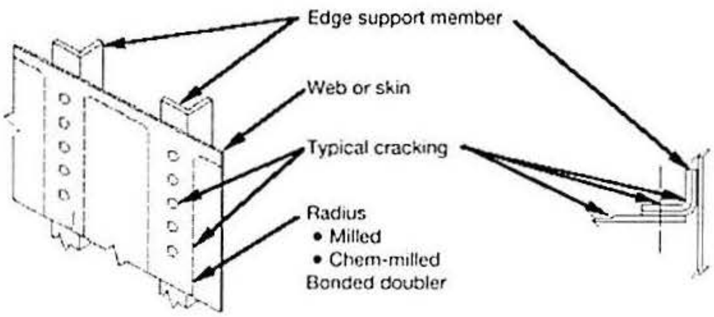
Figure A2-7 ***Aft Pressure Dome Outer Ring and Dome Web Splices (MSD/MED)***



Type and possible location of MSD and MED
- MSD—skin at end fastener holes

Service or test experience of factors that influence MSD and MED (examples)
- Shell discontinuous induced bending stresses
- High load transfer at fastener

Figure A2-8 ***Skin Splice at Aft Pressure Bulkhead (MSD)***



Type and possible location of MSD and MED

Abrupt change in stiffness*
- Milled radius
- Chem-milled radius
- Bonded doubler
- Fastener row at edge support members

Edge member support structure
- Edge member - in radius areas

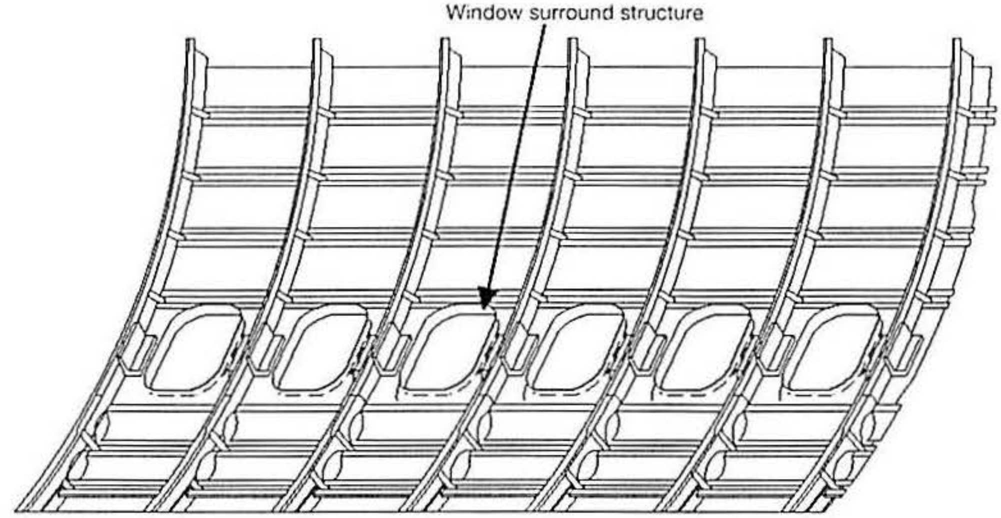
Service or test experience of factors that influence MSD and MED

Pressure structure
- High bending stresses at edge support due to pressure

Non-pressure structure
- Structural deflections cause high stresses at edge supports

* Often multiple origins along edge member

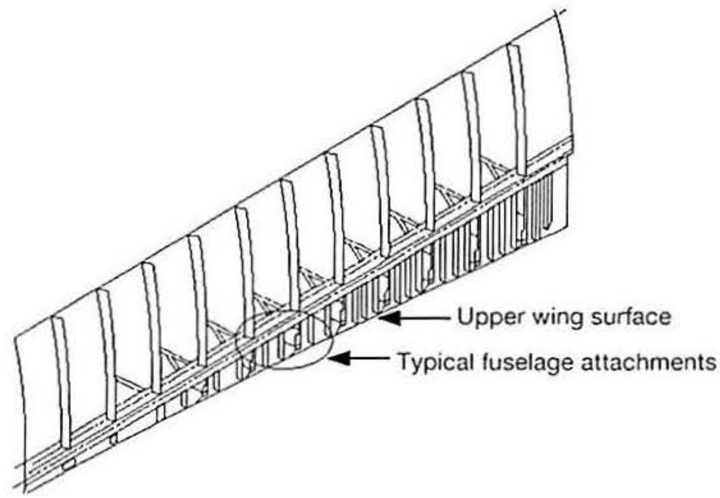
Figure A2-9 *Abrupt Changes in Web or Skin Thickness — Pressurized or Unpressurized Structure (MSD/MED)*



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

Figure A2-10 *Window Surround Structure (MSD, MED)*



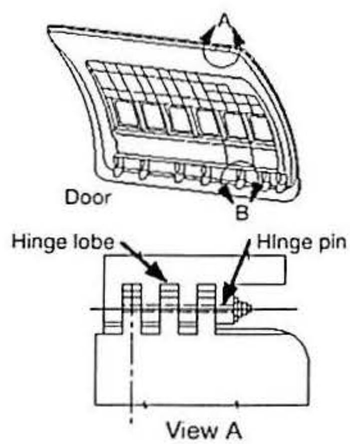
Type and possible location of MSD/MED

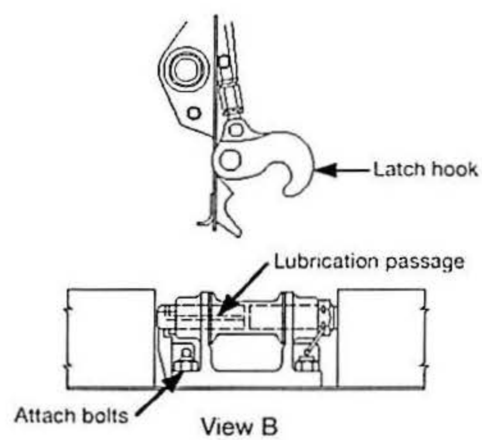
- MED—repeated details in overwing fuselage attachments

Service or test experience of factors that influence MSD and/or MED (examples)

- Manufacturing defect—prestress
- Induced deflections

Figure A2-11 ***Over Wing Fuselage Attachments (MED)***





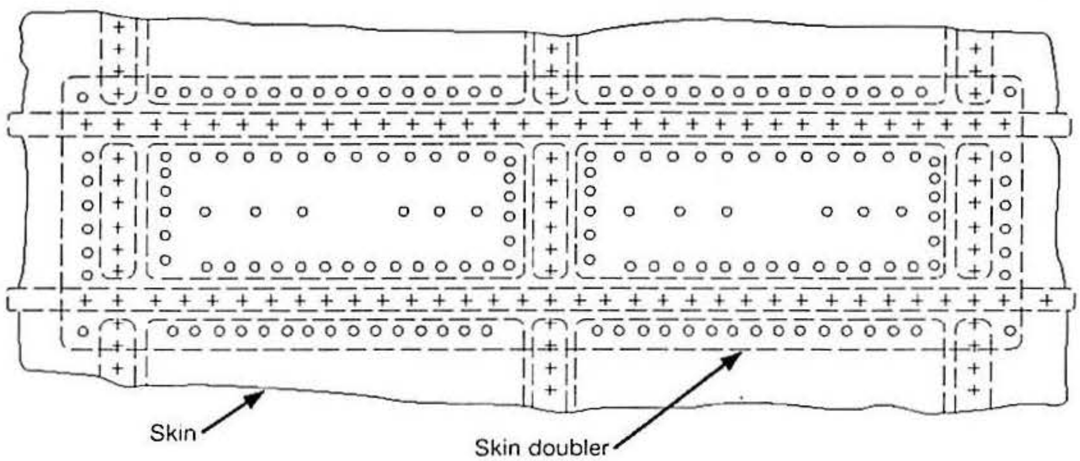
Type and possible location of MSD/MED

- MSD—piano hinge
  - At hinge fastener attachment row
  - In fillet radius
  - Emanating from hole in lobes
- MED—latches
  - In multiple latch hooks
  - At lube channel of latch spool
  - At spool bracket attach bolts (also corrosion)

Service or test experience of factors that influence MSD and/or MED (examples)

- Bending stresses due to fuselage elongation
- High local stress
- Fretting

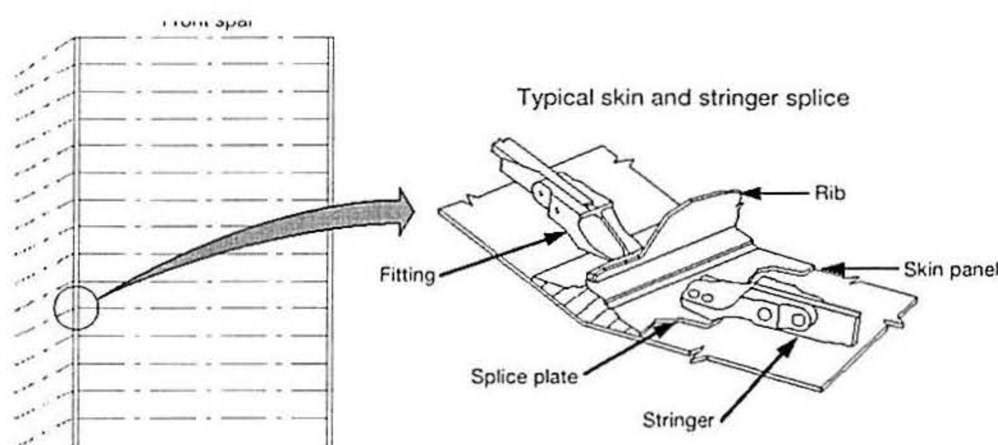
Figure A2-12 ***Latches and Hinges of Non-plug Doors (MSD/MED)***



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

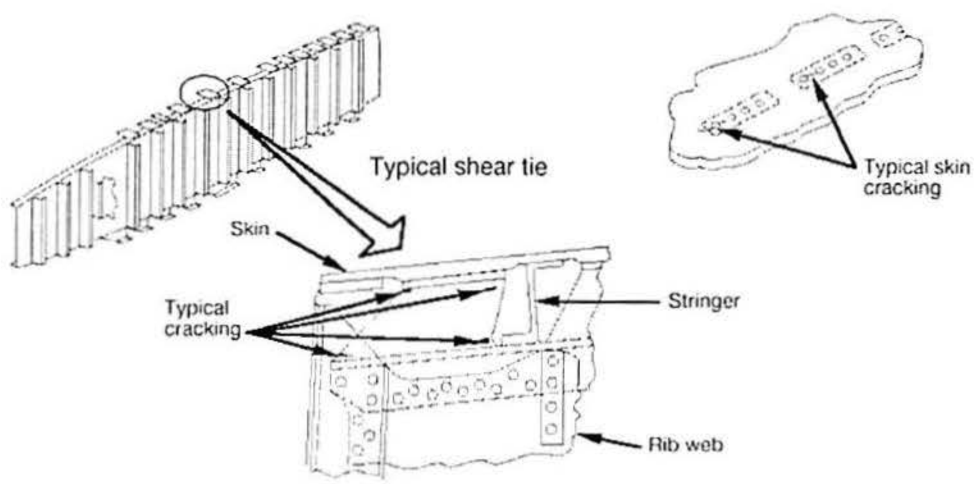
Figure A2-13 ***Skin at Runout of Large Doubler (MSD) — Fuselage, Wing or Empennage***



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

Figure A2-14 ***Wing or Empennage Chordwise Splices (MSD/MED)***



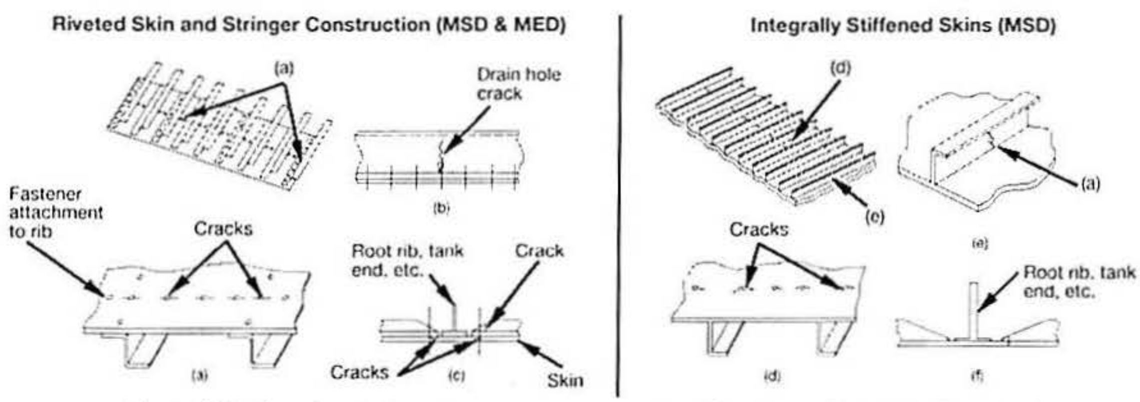
Type and possible location of MSD and MED

- MSD—critical fasteners in skin along rib attachments
- MED—critical rib feet in multiple stringer bays (particularly for empennage under sonic fatigue)

Service or test experience of factors that influence MSD and MED (examples)

- Manufacturing defect—prestress due to assembly sequence
- Sonic fatigue (empennage)

Figure A2-15 ***Rib to Skin Attachments (MSD/MED)***



Inherent fail safe and crack stopper characteristics

- MSD—chordwise cracks link up at
  - a) Rib attachment holes
- MED—
  - b) Drain or vent holes
  - c) Stiffener run-outs at root rib or tank end rib

Do not have inherent crack stopper characteristics of riveted skin and stringer construction

- MSD—Chordwise cracks link up at
  - d) Rib attachment holes
  - e) Drain or vent holes
  - f) Stringer run-outs at root rib or tank end rib
- MED—becomes MSD

Figure A2-16 ***Typical Wing and Empennage Construction (MSD/MED)***

c. **WFD Evaluation.** By the time the highest-time airplane of a particular model reaches its DSG, the evaluation for each area susceptible to the development of WFD should be completed. A typical evaluation process is shown in Figure A2-17. 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:

d. Determination of WFD average behavior in the fleet:

(1) The time in terms of flight cycles/hours to the WFD average behavior 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. If fatigue test evidence is used, Figure A2-18, relates how that data might be reduced in determining WFD Average Behavior. Evaluation may be analytically determined, supported by test or service evidence.

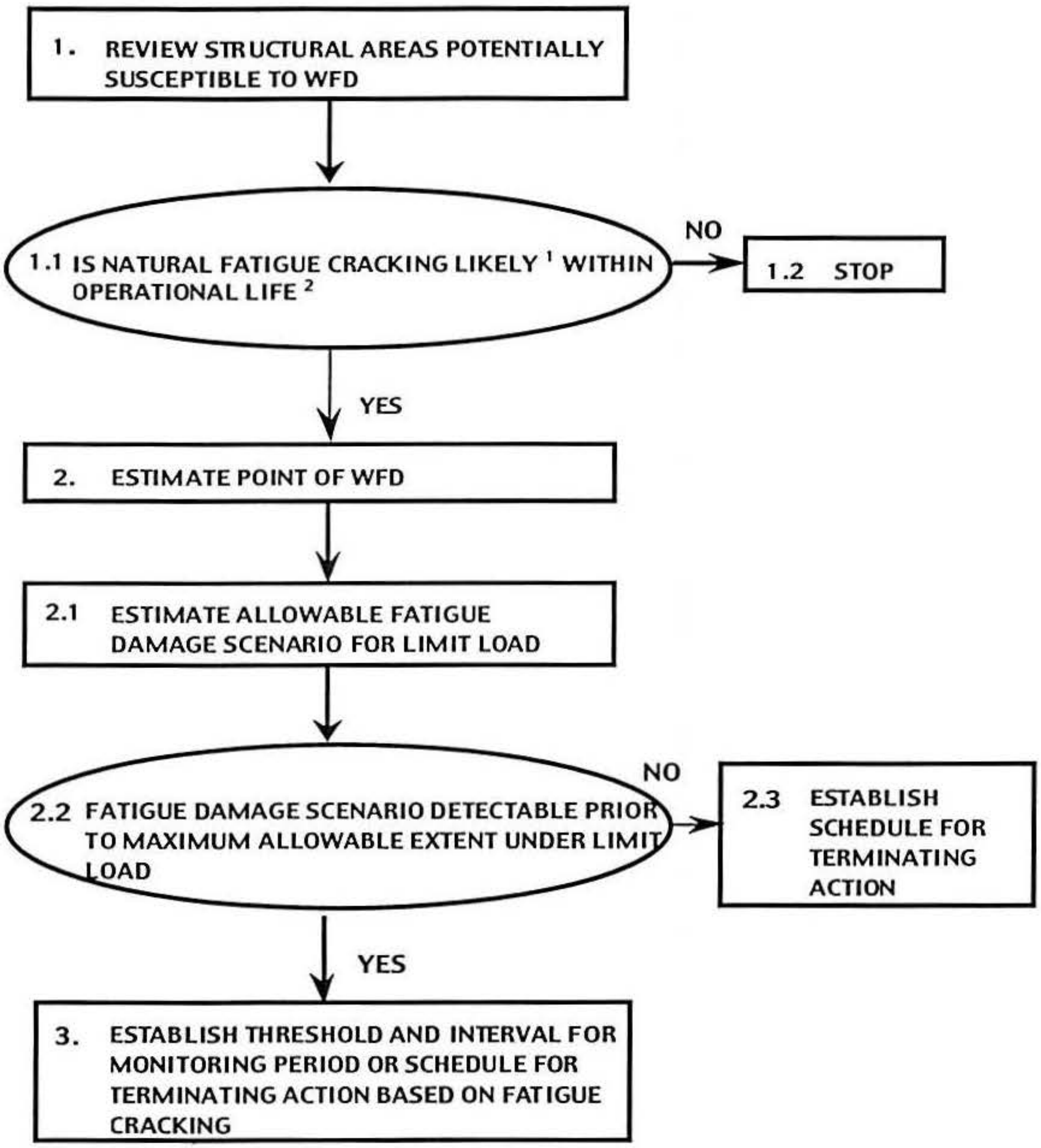
(2) Initial Crack/Damage Scenario: This is an estimate of the size and extent of multiple cracking expected at MSD/MED initiation. This prediction requires empirical data or an assumption of the crack/damage locations and sequence plus a fatigue evaluation to determine the time to MSD/MED initiation. Alternatively, analysis can be based on either:

- the distribution of equivalent initial flaws, as determined from the analytical assessment of flaws found during fatigue test and/or teardown inspections regressed to zero cycles; or
- a distribution of fatigue damage determined from relevant fatigue testing and/or service experience.

(3) Final Cracking Scenario: This is an 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. One such approach is to define the final cracking scenario as a sub-critical condition (e.g., first crack at link-up at limit load). Use of a

sub-critical scenario reduces the complexity of the analysis and, in many cases, will not greatly reduce the total crack growth time.

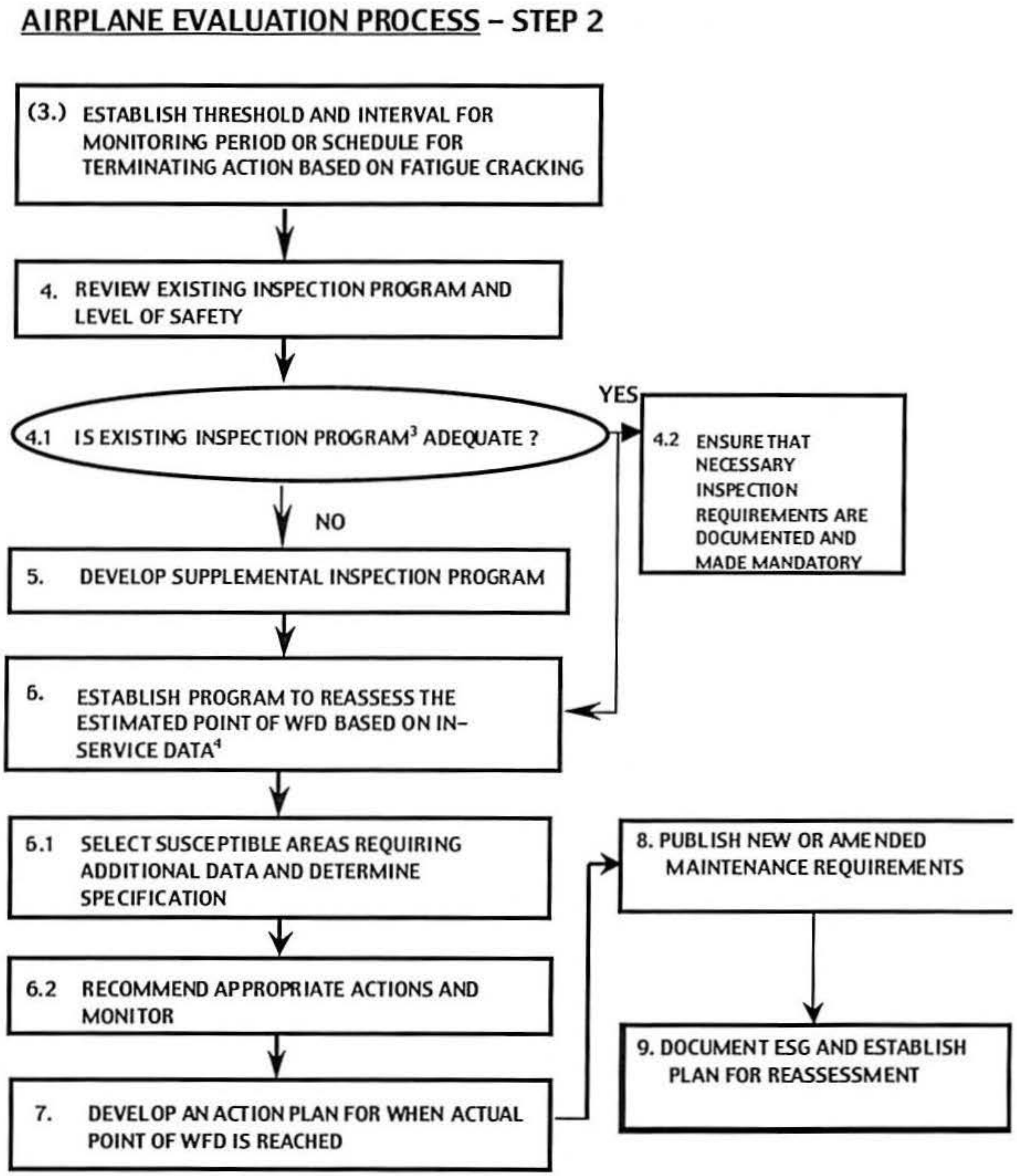
AIRPLANE EVALUATION PROCESS – STEP 1



NOTES

1. Fatigue cracking is defined as likely if the factored fatigue life is less than the projected ESG of the airplane at time of WFD evaluation.
2. The operational life is the projected ESG of the airplane at time of WFD evaluation.

Figure A2-17 *Airplane Evaluation Process, Part 1 of 2*

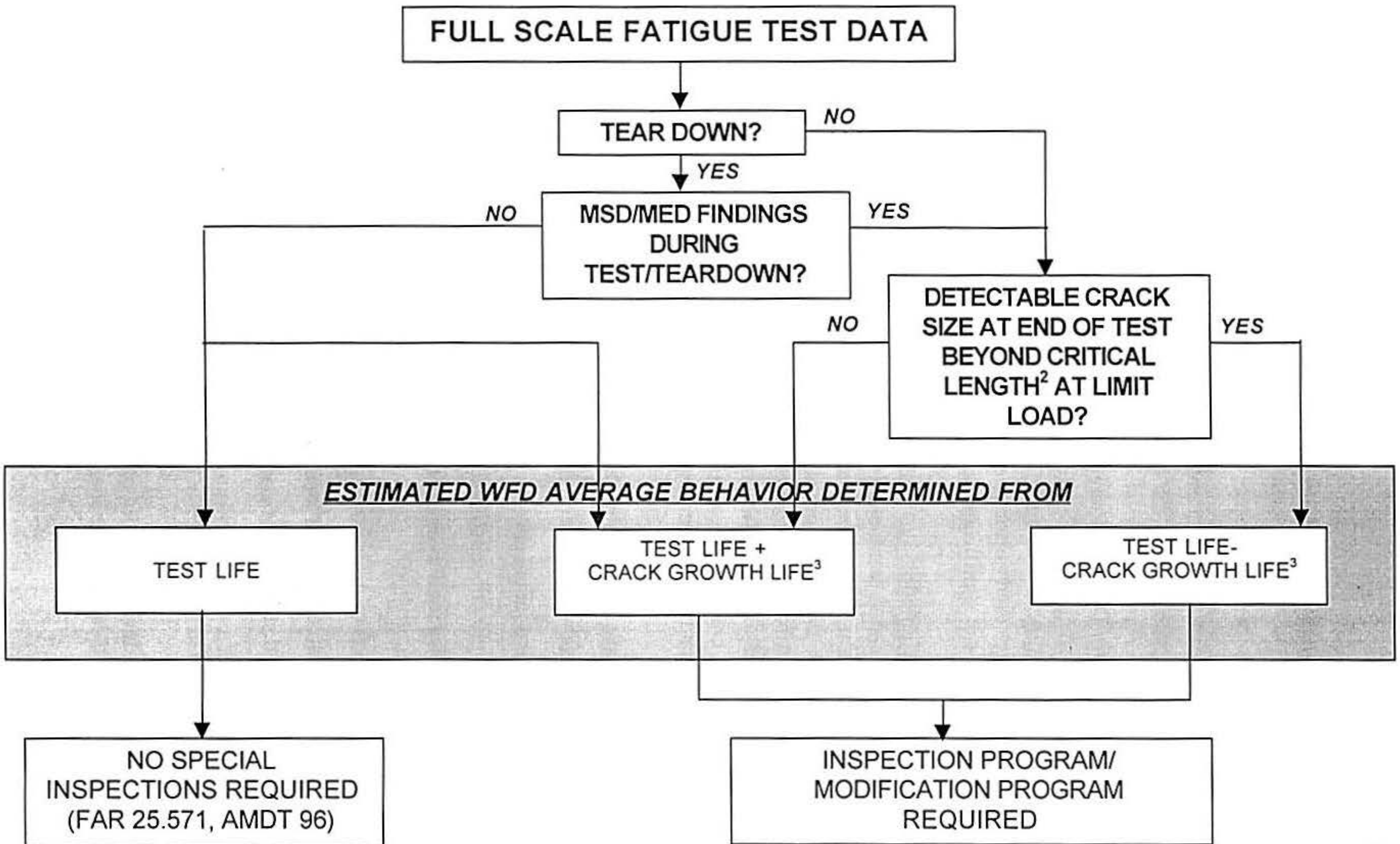


NOTES:

3. Inspection threshold, inspection intervals and inspection methods must be adequate to detect single or multiple cracking.

4. The evaluation process must be repeated if the operational life is increased

Figure A2-17 *Airplane Evaluation Process, Part 2 of 2*



1 ASSUMED STATE AT END OF TEST: Best estimate of non-detected damage from inspection method used at end of test or during teardown.
2 CRITICAL CRACK LENGTH: First link-up of adjacent cracks at limit load (locally) or an adequate level of large damage capability.
3 CRACK GROWTH LIFE: Difference between assumed state at end of test and critical crack length.

Figure A2-18 *Use of Fatigue Test and Teardown Information to Determine WFD Average Behavior*

(4) Crack Growth Calculation: 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 service fractographic data.

(5) 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 described in this guidance material should ensure the MSD sizes and densities, that normally would be expected to exist at the structural modification point, would not significantly change the risk of catastrophic failure due to DSD.

(6) Analysis Methodology: The evaluation methods used to determine the WFD average behavior and associated parameters will vary. The report "Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Airplane Fleet", Revision A, dated June 29, 1999 (a report of the Airworthiness Assurance Working Group for the Aviation Rulemaking Advisory Committee's Transport Aircraft and Engine Issues Group), discusses two Round Robin exercises developed by the TCH's to provide insight into their respective methodologies. One outcome of the exercises was an identification of key assumptions or methods that had the greatest impact on the predicted WFD behavior. These assumptions were:

- the flaw sizes assumed at initiation of crack growth phase of analysis;
- material properties used (static, fatigue, fracture mechanics);
- ligament failure criteria;
- crack growth equations used;
- statistics used to evaluate the fatigue behavior of the structure (e.g., time to crack initiation);
- methods of determining the structure modification point (SMP);
- detectable flaw size assumed;
- initial distribution of flaws; and
- factors used to determine were bound behavior as opposed to mean behavior.

The following elements are developed from paragraphs 3.c.(1) through 3.c.(6), above, and are necessary to establish a MSD/MED maintenance program for the area under investigation.

(7) Inspection Start Point (ISP): This is the point at which inspection starts if a monitoring period is used. 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.

(8) MED Considerations: Due to the redundant nature of semi-monocoque structure, MED can be difficult to manage in a fleet environment. This stems from the fact that most airplane structures are built-up in nature, and that makes the visual inspection of the various layers difficult. Also, visual inspections for MED rely on internal inspections and, therefore, recurring intervals are normally much greater than for external skin inspections. However, these issues are dependent on the specific design involved and the amount of damage being considered. In order to implement a viable inspection program for MED, the following conditions must be met:

(a) Static stability must be maintained at all times.

(b) Large damage capability should be maintained.

(c) There is no concurrent MED with MSD in a given structural area.

(9) Structural Modification Point (SMP).

(a) The applicant should demonstrate that the proposed SMP established during the audit has 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, based on the viability of inspections in the monitoring period. The SMP can be determined by dividing the WFD Average Behavior by a factor of 2 if there are viable inspections, or by a factor of 3 if inspections are not viable.

(b) Whichever approach is used to establish the SMP, a study should be made to demonstrate that the approach ensures that the expected extent of MSD/MED at the SMP still has a LDC to address damage from sources such as accidental damage, fatigue damage, or environmental degradation.

(c) An airplane may not be operated past the SMP unless the structure is modified or replaced, or unless additional approved data is provided that would extend the SMP. However, if during the structural evaluation for WFD, a TCH finds that the flight cycles and/or flight hours SMP for a particular structural detail have been exceeded by one or more airplanes in the fleet, the TCH should expeditiously evaluate selected high time airplanes in the fleet to determine their structural condition. From this evaluation, the TCH should notify the airworthiness authorities and propose appropriate service actions independent of the audit.

(d) The initial SMP may be adjusted based on the following:

(i) In some cases, the initial SMP may be extended without changing the required reliability of the structure, i.e. projection to that of a two life time full-scale fatigue test. These cases are:

- Additional fatigue and/or residual strength tests on a full-scale airplane structure or a full-scale component followed by detailed inspections and analyses.
- Testing of new or used structure on a smaller scale than full component tests (i.e., sub-component and/or panel tests).
- Teardown inspections (destructive) that could be done on structural components that have been removed from service.
- Local teardown by selected, limited (non-destructive) disassembly and refurbishment of specific areas of high-time airplanes.
- In-service date from a statistically significant number of airplanes close to the original SMP showing no cracking compared with the predictions. This data may be used to support increasing the original SMP by an amount that is agreed by the authority.
- Or a combination of any or all of the above.

(ii) If cracks are found in the structural detail for which the audit was done during either the monitoring period or the modification program, the SMP should be reevaluated to ensure that the SMP does in fact provide the required confidence level. If it is shown that the required confidence level is not being met, the SMP should be adjusted and the adjustment reflected in appropriate service bulletins to address the condition of the fleet. Additional regulatory action may be required.

(10) 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 cannot be detected, the SMP must be reevaluated to ensure there is a high confidence level that no airplane will develop MSD/MED before modification.

d. **Evaluation of Maintenance Actions**

(1) 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.

(2) 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.

(a) Determine the inspection requirements (method, 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.

(b) Review the elements of the existing maintenance programs already in place

(c) Revise and highlight elements of the maintenance program necessary to maintain safety.

(3) 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.

e. **Period of Evaluation Validity**:

(1) 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. However, it may be appropriate to vary the evaluation validity period depending on issues such as:

(a) the projected useful life of the airplane at the time of the initial evaluation;

(b) current non-destructive inspection (NDI) technology; and

(c) airline advance planning requirements for introduction of new maintenance and modification programs, to provide sufficient forward projection to identify all likely maintenance/modification actions essentially as one package.

(2) 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.

4. DOCUMENTATION.

a. 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 (LOV) 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. Since WFD is a safety concern for all operators of older airplanes, the FAA will make mandatory the identified inspection or modification programs. In addition, the FAA may consider separate AD action to address 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.

b. The following items should be contained in the FAA-approved documentation:

(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) maintenance program LOV in terms of flight cycles or flight hours.

c. The FAA-approved documentation should contain at least the following information for each critical part or component:

(1) description of the primary structure susceptible to WFD;

(2) details of the monitoring period (inspection start point, repeat inspection interval, SMP, inspection method and procedure (including crack size, location and direction) and alternatives) when applicable;

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

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

(5) service bulletins (or other service information publications) 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

(6) guidance to the operator on which inspection findings should be reported to the manufacturer, and appropriate reporting forms and methods of submittal.

5. REPORTING REQUIREMENTS

a. Operators, STC Holders and TCHs are required to report in accordance with various regulations, for example § 121.703, § 21.3, etc. (The regulations to which this AC relates do not require any reporting requirements in addition to the current ones.) 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 and manufacturer communication has been useful in identifying and resolving a number of issues that can be classified as WFD concerns. MSDMED has been discovered via fatigue testing and in-service experience. Airplane TCH's 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.

b. When damage is found while conducting an FAA-approved MSD/MED inspection program, or at the SMP where replacement or modification of the structure is occurring, the TCHs, STC Holders 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; and

- adjacent repairs within the same PSE.

c. 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.

d. 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.

e. Documentation will be provided by the TCH and 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.

6. STRUCTURAL MODIFICATIONS, REPAIRS, AND ALTERATIONS

a. All major modifications (STC's), repairs, and alterations that create, modify, or affect structure that is susceptible to MSD/MED (as identified by the TCH) must be evaluated to demonstrate the same confidence level as the original manufactured structure. The operator is responsible for ensuring the accomplishment of this evaluation. The operator may first need to conduct an assessment on each of its airplanes to determine what modifications, repairs, or alterations would be susceptible to MSD/MED. The following are some examples of types of modifications, repairs, and alterations that present 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 splice; and
- any modification, repair, or alteration that affects several frame bays.

b. 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 TCH baseline maintenance program requirements.);

- a modification that results in operational mission change that significantly changes manufactures load/stress spectrum (for example, a passenger-to-freighter conversion); and
- a modification that changes areas of the fuselage from being externally inspectable using visual means to being uninspectable (for example, a large external fuselage doubler that resulted in hidden details, rendering them visually uninspectable).

7. **RESPONSIBILITY**. It is expected that the evaluation will be conducted in a cooperative effort between the operators and TCH's, with participation by the appropriate airworthiness authorities during the evaluation.

Action: ARM
AVS-1
Sig.

Pratt & Whitney
400 Main Street
East Hartford, CT 06108

Pratt & Whitney
A United Technologies Company

July 25, 2006

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

Attention: Mr. Nicholas Sabatini, Associate Administrator for Aviation Safety

Subject: ARAC Tasking, FR Doc. 04-10816, Dated May 13, 2004, Phase 1, Task 2

Dear Nick,

The Transport Airplane and Engine Issues Group are pleased to submit a Final Report concerning the referenced task as an ARAC recommendation. The FAA tasking requested the Airworthiness Assurance Working Group (AAWG) to consider how best to comply with the requirements set forth in 14 CFR 121.370a and 129.16 of the Aging Airplane Safety Final Rule.

This final report is being submitted as a full consensus position of the AAWG and TAEIG.

The Task assigned from ARAC was split into two Phases and four subtasks. Subtasks 1, 2 and 3 are addressed in Phase 1 and Subtask 4 is addressed in Phase 2. This final report covers the activities specifically requested in the follow-on work authorized by the TAEIG for Phase 1, Task 2 and complements the work previously submitted for Phase 1, Task 1, 2 and 3. Specifically, the AC, submitted for Task 1 of Phase 1, has been updated to contain guidance on how best to develop and provide DT data for alterations and repairs to alterations for persons seeking compliance to §§121.1109 and 129.109 (§§ 121.370a and 121.16 have been redesignated as §§121.1109 and 129.109 respectively)

Sincerely,

Craig R. Bolt

C. R. Bolt
Assistant Chair, TAEIG

Copy: (letter only):
Dionne Krebs – FAA-NWR
Mike Kaszycki – FAA-NWR
John Linsenmeyer – FAA-Washington, D.C., ARM-207
TAEIG Distribution List

May 16, 2006

Craig Bolt
Assistant Chair
Transport Airplane and Engine Issues
Aviation Rulemaking Advisory Committee
Pratt & Whitney
400 Main Street
East Hartford Connecticut 06108

RE: ARAC; Transport Airplane and Engine Issues – New Task FR Doc. 04-10816, Dated May 13, 2004, Phase 1, Task 2 Close-out.

Dear Mr. Bolt

On behalf of the Airworthiness Assurance Working Group (AAWG), we, the undersigned, are pleased to submit a Final Report concerning the referenced task for your consideration. The FAA tasking requested the AAWG to consider how best to comply with the requirements set forth in 14 CFR 121.370a and 129.16 of the Aging Airplane Safety Final Rule.

This final report is being submitted as a full consensus position of the AAWG; there are no dissenting opinions.

The Task assigned from ARAC was split into two Phases and four subtasks. Subtasks 1, 2 and 3 are addressed in Phase 1 and Subtask 4 is addressed in Phase 2. This final report covers the activities specifically requested in the follow-on work authorized by the TAEIG for Phase 1, Task 2 and complements the work previously submitted for Phase 1, Task 1, 2 and 3. Specifically, the AC, submitted for Task 1 of Phase 1, has been updated to contain guidance on how best to develop and provide DT data for alterations and repairs to alterations for persons seeking compliance to §§121.1109 and 129.109 (§§ 121.370a and 121.16 have been redesignated as §§121.1109 and 129.109 respectively)

The AAWG is continuing to work on *Task 3 – Widespread fatigue Damage (WFD) of Repairs, Alterations and Modifications*. We are in the process of reviewing the recently released WFD NPRM and EASA NPA 05-2006 and comparing it to the requested task elements for Task 3. We have noted, in that review, some significant issues between the WFD NPRM, EASA NPA, previously submitted ARAC developed means of compliance and the TAEIG authorized work statement (Approved December 11, 2005) that may require further clarification and possible redirection for the AAWG to complete its task. We will be preparing a summary of our thoughts on the subject for discussion at the June 27, 2006 phone call. The AAWG will make this summary available approximately one week prior to the meeting.

The AAWG wishes to thank the FAA and ARAC; TAEIG for allowing us to participate in this important rule making event.

Rao Varanasi

Rao Varanasi	*Mark Yerger*
Co-Chairperson, AAWG	*Co-Chairperson, AAWG*
Boeing Commercial Airplanes	*Federal Express*

A REPORT OF THE AIRWORTHINESS ASSURANCE WORKING GROUP

RECOMMENDATIONS CONCERNING ARAC TASKING FR Doc. 04-10816

RE: AGING AIRPLANE SAFETY FINAL RULE

14 CFR 121.370a AND 129.16

TASK 2 CLOSEOUT

FINAL REPORT

May 12, 2006

SIGNED BY

Rao Varanasi
Co-Chairperson, AAWG
Boeing Commercial Airplanes

Mark Yerger
Co-Chairperson, AAWG
Federal Express

REVISION PAGE

LTR	DATE	CHANGE	PAGES ADDED	PAGES DELETED	PAGES CHANGED	APPROVED BY

Table of Contents

List of Figures

List of Tables

List of Abbreviations

The following abbreviations are used throughout this report

AASA	Aging Airplane Safety Act of 1991
AASFR	Aging Airplane Safety Final Rule
AASIFR	Aging Airplane Safety Interim Final Rule
AATF	Airworthiness Assurance Task Force
AAWG	Airworthiness Assurance Working Group
AC	Advisory Circular (FAR)
ACO	Aircraft Certification Office
AD	Airworthiness Directive
AIA	Aerospace Industries Association of America
ALS	Airworthiness Limitation Section
ARAC	Aviation Rulemaking Advisory Committee
ATA	Air Transport Association of America
ATC	Amended Type Certificate
CAA	Civil Aviation Authority
CAR	Civil Airworthiness Requirements
CFR	Code of Federal Regulations
DAH	Design Approval Holder
DSG	Design Service Goal
DT data	Damage Tolerance Data
DTE	Damage Tolerance Evaluation
DTIP	Damage Tolerance Inspection and Procedures
EASA	European Aviation Safety Agency
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
ISP	Inspection Start Point
LOV	Limit of Validity
MPD	Maintenance Planning Document
NDI	Non Destructive Inspection
NPRM	Notice of Proposed Rulemaking
OEM	Original Equipment Manufacturer
OIP	Operator Implementation Program
PMI	Principal Maintenance Inspector (FAA)
RAG	Repair Assessment Guidelines
RAM	Repairs, Alterations and Modifications
RAP	Repair Assessment Program
SB	Service Bulletin
SMP	Structural Modification Point
SRM	Structural Repair Manual
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

List of References

The following is provided as a means to access current rules and regulations together with previous ARAC Recommendations from the AAWG. Documents noted by an (*) are available at the following web site.

http://www.faa.gov

1. Title 14 of the Code of Federal Regulations (14 CFR): The following Regulations are referenced in this report:

a. Part 21, §21.101*
b. Part 25, §§ 25.571*, 25.1529*
c. Part 43, §§ 43.13*, 43.16*
d. Part 91, § 91.403*
e. Part 121, §§ 121.1105*, 121.1107*, 121.1109*
f. Part 129, §§ 129.109*, 129.107*, 129.105*

2. Advisory Circulars (AC): The following Advisory Circulars are reference in this report:

a. AC 21.101-1, Change Product Rule*
b. AC 25.571-1, Damage Tolerance and Fatigue Evaluation of Structure*
c. AC 25.571-1A, Damage Tolerance and Fatigue Evaluation of Structure*
d. AC 25.571-1B, Damage Tolerance and Fatigue Evaluation of Structure*
e. AC 25.571-1C, Damage Tolerance and Fatigue Evaluation of Structure*
f. AC 25.1529-1, Instructions for Continued Airworthiness of Structural Repairs on Transport Airplanes*
g. AC 91-56A, The Continued Airworthiness of Older Airplanes*
h. AC 91-56B, The Continued Airworthiness of Older Airplanes*
i. AC 120-73, Damage Tolerance Assessment of Repairs to Pressurized Fuselages*

3. Other Documents referred to in this report:

a. A Final Report of the AAWG – Continued Airworthiness of Structural Repairs*
b. A Report of the AAWG – Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Airplane Fleet*
c. A Report of the AAWG - Recommendations For Regulatory Action To Enhance Continued Airworthiness Of Supplemental Type Certificates*
d. Repair Assessment Guidelines, FAA Approved Model Specific Guideline Documents**
e. FAA Approved Model Specific Supplemental Inspection Documents**
f. ATA Report 51-93-01 - Structural Maintenance Program Guidelines For Continuing Airworthiness***
g. ATA Response to FAA Docket 1999-5401 Dated May 5, 2003***
h. Federal Register/Vol. 69, No. 146/Friday, July 30, 2004/Rules and Regulations Fuel Tank Safety Compliance Extension (Final Rule) and Aging Airplane Program Update (Request for Comments). Page 45936*
i. A Report to the AAWG - Structures Task Group Guidelines Document, June 1996*
j. Federal Register/ Vol. 67, No. 235 / Friday, December 6, 2002 / Rules and Regulations Aging Airplane Safety
k. A Report of the AAWG – Recommendations Concerning ARAC Tasking FA Doc. 04-10816 RE: Aging Airplane Safety Final Rule 14 CFR 121.370a and 129.16 dated 28 October 2005

** Various manufacturers publish these documents. Please contact those manufacturers to determine the general availability of the documents.

*** Please contact the ATA.

Executive Summary

On May 13, 2004, the FAA published a new ARAC tasking and assigned it to the Transport Airplane and Engine Issue Group/Airworthiness Assurance Working Group. The Tasking requested Industry assistance in preparing guidance material for certificate holders wishing to show compliance to the Aging Airplane Safety Final Rule, 14 CFR 121.1109 and 129.109. The Tasking consisted of four sub-tasks to be accomplished in two phases. In Phase 1, tasks 1, 2, and 3 are completed; in Phase 2, task 4 is completed.

The AAWG submitted a report (ref 3.k.) dated 28 October 2005 that included an AC which proposed a means of compliance for damage tolerance inspections and procedures for repairs (Task 1). In the process of completing the Phase 1 activities, the report also provided recommendations with respect to damage tolerance inspection and procedures for alterations (Task 2). In addition, recommendations were made concerning with respect to widespread fatigue damage assessment of repairs and alterations (Task 3). The AAWG, at the direction of ARAC has considered these recommendations and have proposed advisory material and other data to complete Phase 1 of the tasking. This report documents the finalized AAWG recommendations for alterations (Task 2). A separate report will be published documenting the actions from the WFD (Task 3) recommendations.

In approving the results of the Phase 1 activities, the TAEIG requested clarification in three areas.

1. Concerning the proposed AC 120.AAWG contained in the Reference 3.k report, the TAEIG requested that a responsibility matrix be provided that would detail the various tasks including responsible parties the generation of data and a time line stipulating when the data would be provided to other parties. Information should include principle points where Operators, TCHs and DAHs share information. This has been completed and is documented in Section 2.A.1).d) of this report.
2. One Engine Manufacturer indicated that the inclusion of Nacelles in the list of major modifications is problematical and should not be there. AAWG has an action item to review its position and provide a rationale for the removal/retention of Nacelles from this list. The AAWG has decided to remove the term Nacelles from the list of candidate STCs for consideration. The rationale for this change is documented in Section 2.A.3).a)(3) of this report
3. One member of the TAEIG wants to retain 25.1529 since some airplanes, not effected by the AASFR rely on it's guidance. The AAWG has an action to review its recommendation. Upon further review, the AAWG concurs and now recommends that AC 25.1529-1 be retained and modified in part to specify the airplanes that it is applicable to. Those Recommendations are contained in Section 2B and Appendix C of this report.

Conclusions and Recommendations (Alterations/Modifications)

The AAWG has revised draft AC 120-AAWG to include the process for assessing both repairs and alterations to fatigue critical structure using damage tolerance principles. The proposed AC addresses repairs and alterations to both baseline structure as well as repairs to alteration and modifications. The AAWG believes that the proposed AC 120-AAWG contains sufficient guidance for all DAHs to develop a Compliance Document which would support operator compliance with the AASFR for repairs and alterations.

Key to initiating this process is the identification of fatigue critical structure for each applicable airplane model. Repairs and alterations to the fatigue critical structure will need to be assessed for damage tolerance. Depending on the certification level of the aircraft model and whether installed repairs and alterations are already covered by DT data, this may require a survey of the aircraft.

The conclusions and recommendations from the AAWG tasking regarding alterations are documented in Section 3 of this report. These are summarized below.

Conclusions:

1. A survey of 10 operators revealed that there are approximately 246 alterations installed on the active commercial fleet. Of the 246, 171 did not have DT data, and 24 of the 171 were deemed complex.

2. The conclusions and recommendations contained in the AAWG report on MCSTCs are still strongly supported by the industry. Those conclusions and recommendations address issues with complex STCs which are still being considered by the FAA. Any action on complex STCs is therefore deferred to the FAA and their deliberations.

3. Operators are required to keep permanent records of alterations installed on their aircraft where requirements for record keeping for repairs may only extend to the next major maintenance visit.

4. Once an alteration is approved for installation, operators may purchase alterations from their owners and install them on their fleet. The data package may or may not have DT data included.

5. The engineering support of an alteration is the responsibility of the DAH and extends to the provision of DT data for continued airworthiness. In the absence of the DAH, the responsibility falls to the operator.

6. The process for compliance for alterations is dependant upon timely communications between the FAA, DAH and operators and consistent application of standards by the FAA.

7. Implementation Plans for Alterations

    a. Installed alterations are a matter of record with a particular airline and therefore implementation plans can be handled differently than repairs.

    b. Implementation plans for alterations are dependant on the willingness or availability of DAH to support the alteration with DT data, if required.

    c. There is a possibility that deactivated alterations exist on an airplane that are not part of the records that an operator holds. In these cases, the repairs survey would be used to reveal these deactivated alterations for appropriate action.

8. Rotable Components

    a. Alterations to rotable components can use the same guidance developed for repairs to rotable components contained in the original issue of AC 120-AAWG.

    b. Based on an EASA request, the AAWG concluded that there was a potential issue with the tracking of rotable components in the industry, however we were not tasked to consider this.

9. Analysis of Alterations for DTA

    a. The DT data for an alteration must include both an assessment of the new FCS added by the alteration and it's affect both locally and globally on the baseline FCS.

    b. Because alterations tend to be unique, DT data will need to be developed for each unique installation. The use of RAG type programs may not be feasible.

    c. For existing alterations that require a new DTE, the DAH should use 14 CFR 25.571 at Amendment 45 or the certification basis of the airplane whichever is greater.

    d. Dependant on the scope of the modification, the applicant may need to revisit published documents such as the SRM to insure that the information is still valid.

Recommendations

1.0 The AAWG Recommends that AC 120-AAWG be promulgated as a means of compliance to 14 CFR 121.1109 and 129.109 with respect to repairs and alterations. A copy of this AC is contained in Appendix B.

2.0 The AAWG recommends that operators keep records on repairs that affect Fatigue Critical Structure.

3.0 The FAA provide adequate direction and training to it's ACO and Flight Standards staff to ensure that there is uniformity in the administration of these regulations across the industry.

1. Introduction

A. New Tasking

On May 13, 2004, the FAA published a new ARAC tasking and assigned it to the Transport Airplane and Engine Issue Group/Airworthiness Assurance Working Group. The Tasking requested Industry assistance in preparing guidance material for certificate holders wishing to show compliance to the Aging Airplane Safety Final Rule, 14 CFR 121.1109 and 129.109. The Tasking consisted of four sub-tasks to be accomplished in two phases. In Phase 1, Tasks 1, 2, and 3 are completed; in Phase 2, Task 4 is completed. The complete tasking statement is contained in Appendix A and summarized below.

1) Phase 1 – Preparation of Guidance Material

Phase 1 of the task requirements require the definition of guidance material and recommendations on the following subjects.

a) Task 1 – Repairs to Fatigue Critical Structure and Repairs to Alterations and Modifications

In Section 2 of this report, the AAWG has developed the rationale for the guidance material that will enable the operators to develop damage tolerance maintenance programs for repairs to fatigue critical structure and repairs to alterations and modifications. The actual proposed Advisory Circular is contained in Appendix B of this report. The FAA requested several subtask be evaluated in the development of the advisory material. These evaluations were conducted and the appropriate information included.

b) Task 2 – Alterations and Modifications

In Section 3 of this report the AAWG provides recommendations to the FAA on appropriate means to develop damage tolerance based maintenance programs for alterations and modifications. These recommendations are in the form of a request for an additional tasking to develop an amended Advisory Circular to include a process to develop the required programs

c) Task 3 – Consideration of Widespread Fatigue Damage for RAMs

In Section 4 of this report, the AAWG provides recommendations to the FAA on appropriate means to include the consideration of WFD prevention for installed repairs, alterations and modifications. These recommendations are in the form of a request for an additional tasking to develop an amended Advisory Circular to include a process to develop the required programs

2) Phase 2 – Task 4 Preparation of Compliance Data

Section 5 of this report briefly describes the expected process the industry will use to develop and implement the required programs.

B. 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:

ABx Air*
Airbus *
Airline Pilot's Association
American Airlines*
Air Transport Association
American West Airlines
Boeing Commercial Airplanes*
British Airways*
Continental Airlines*
Delta Air Lines Incorporated*
Evergreen International Airlines
Federal Aviation Administration*
Federal Express*
Fokker Service
International Air Transport
Japan Air Lines*
EASA*
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 participated in the task group. A list of meeting venues and meeting attendance is documented in Appendix D respectively.

2. Task 2 – Evaluation of Alterations and Modifications for Damage Tolerance

A. Task 2 - Element 1 – Recommendations for Damage Tolerance Based Inspections of Alterations and Modifications

The AAWG was asked to review and comment on:

Prepare a written report assessing how an operator would include damage tolerance-based inspections and procedures for alterations and modifications made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure....

AAWG Recommendation Number 8 Regarding Task 2

The AAWG recommends that the TAEIG task the AAWG to revise AC 120-AAWG to include a process for developing damage tolerance based maintenance inspections for alterations and modifications. A copy of the proposed tasking is included in Appendix E of Reference 3.k.

AAWG Proposed Task 2 Action Plan

Task 2 Proposed Action Plan for Follow-on Activities– Damage Tolerance Based Inspections And Procedures For Alterations And Modifications.

The AAWG determined that additional specific guidance material was necessary for the industry to uniformly develop DT data for previously installed Alterations and Modifications. Specifics of that recommendation requested that the TAEIG task the following to the AAWG:

1. The AAWG will prepare and submit guidance materials for consideration of alterations and modifications to the TAEIG within six months of TAEIG acceptance of the written report.
2. Upon TAEIG acceptance of the AAWG guidance material, the AAWG will recommend that Model Specific STGs invite STC DAH and involve them in the dialog to ensure that DT data is in existence on December 18, 2009 for all commonly embodied alterations in concert with Task 4 of the original tasking.

1) Introduction

Compliance with 14 CFR 121.1109 and 129.109 requires a damage tolerance based maintenance program for fatigue critical structure. These requirements extend to the baseline, as delivered structure, repairs to that structure, alterations and repairs to alterations. The FAA has also proposed rules that would require the DAH to provide information in support of operator compliance under 14 CFR 25.1823, 25.1825, and 25.1827. In expectation of these rules, the FAA also issued a tasking to ARAC/TAEIG/AAWG to provide guidance material for both the operator and the DAH.

In a previous ARAC tasking, the AAWG submitted advisory material concerning DAH and operator actions necessary for repairs to baseline, as delivered fatigue critical structure as well as repairs to alterations. In a subsequent action by the TAEIG, the TAEIG authorized the AAWG to develop guidance material for alterations. This section of the report documents the findings of the AAWG that lead to the technical basis of AC 120.AAWG-1 contained in Appendix B.

The AC contained in Appendix B is based on the previously submitted AC 120.AAWG. This AC was published as AC 120.xx for comment on April 21, 2006, for repairs to fatigue critical structure. AC 120.AAWG has now been revised to include the actions necessary to determine a damage tolerance based maintenance program for alterations and the steps necessary to incorporate that information into an operators maintenance program.

a) Terminology and References to 14 CFR Section Numbers

For the purposes of this report, the term "alteration" is used to describe a design change and encompasses the terms "modification" and "Supplemental Type Certificate (STC)."

During the codification process, the FAA has made a proposal to re-designate the section numbers of existing rules to accommodate their initiatives set forth in FAA Policy Statement PS-ANM110-7-12-2005. The following table lists the various rules and their old and new designations. Where possible, this report uses the new proposed 14 CFR designations, but in all cases these designations should be thought of as interchangeable for the purposes of this report

Current 14 CFR Designation	Proposed 14 CFR Designation	Title
121.368	121.1105	Aging airplane inspections and records review
121.370	121.1107	Special maintenance program requirements
121.370a	121.1109	Supplemental Inspections
129.16	129.109	Supplemental inspections
129.32	129.107	Special maintenance program requirements
129.33	129.105	Aging airplane inspections and records review for US-registered multiengine aircraft

b) Operator STC Data

In order to understand the overall impact of the proposed guidance material will have on the industry, it was decided to collect data on the number and type of alterations that might require development of DT data within the fleet. The AAWG Task Group asked member operators to compile a listing of all alterations that affect fatigue critical structure, to indicate whether DT data is currently available for this alteration, and if not, whether the operator has contacted the STC holder to obtain the necessary DT data for compliance with 14 CFR 121.1109 and 129.109. Guidelines for filtering the list were provided based on a previous ARAC tasking involving Multiple Complex STCs together with the additional consideration of two items. Those items included (1) installation of interior mass items and (2) antenna installations. As a result, the list of alterations below was deemed of primary interest.

i) Passenger-to-freighter conversions (including addition of main deck cargo doors).
ii) Gross weight increases (increased operating weights, increased zero fuel weights, increased landing weights, and increased maximum takeoff weights).
iii) Installation of fuselage cutouts (passenger entry doors, emergency exit doors or crew escape hatches, fuselage access doors, cabin window relocations and antenna installations).
iv) Complete re-engine or pylon alterations.
v) Engine hush-kits.
vi) Wing alterations such as installing winglets or changes in flight control settings (flap droop), and alteration of wing trailing edge structure.
vii) Modified skin splices.
viii) Any alteration that affects several stringer or frame bays.
ix) An alteration that covers structure requiring periodic inspection by the operator's maintenance program.
x) An alteration that results in operational mission change that significantly changes the manufacturer's load or stress spectrum, e.g. passenger-to-freighter conversion.
xi) An alteration 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.
xii) Interior Mass items (Monuments)
xiii) Antenna installations

Ten operators responded to our request, yielding 246 alterations installed on their fleets. Of the 246 alterations, 171 do not currently have DT data. Of the 171 alterations that currently do not have DT data, 24 of them where deemed multiple complex STCs. These included hush-kits, re-engine or pylon alterations, passenger-to-freight modifications, winglet installations, and gross weight increases.

c) STC Interaction

On March 22, 2001, the FAA published a task in the Federal Register for ARAC/ TAEIG/AAWG on the subject of Multiple Complex Supplemental Type Certificates. The following is an excerpt from the Federal Register detailing the scope and deliverables expected from ARAC.

16089 Federal Register / Vol. 66, No. 56 / Thursday, March 22, 2001 / Notice

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration Aviation Rulemaking Advisory Committee; Transport Airplane and Engine Issues—New Task AGENCY: Federal Aviation Administration (FAA), DOT. ACTION: Notice of new task assignment for the Aviation Rulemaking Advisory Committee (ARAC). SUMMARY: The FAA assigned the Aviation Rulemaking Advisory Committee a new task to study the effects of multiple complex structural supplemental type certification (STC) modifications installed on transport category airplanes. The ARAC will develop a report with recommendations for a long-term plan addressing the effects of multiple complex STC modifications on the structural integrity and continued safe operations of transport category airplanes. This notice is to inform the public of this ARAC activity.

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

SUPPLEMENTARY INFORMATION:

Background

The FAA established an Aviation Rulemaking Advisory Committee to provide advice and recommendations to the FAA Administrator on the FAA's rulemaking activities with respect to aviation-related issues.

The Task

Study the effects of multiple complex structural STC modifications installed on transport category airplanes. Develop a report with recommendations for a long term plan addressing the effects of multiple complex STC modifications on the structural integrity and continued safe operation of transport category airplanes, and the ability of the operators to accomplish mandatory FAA aging fleet programs.

The report should identify the types of structural modifications considered to be complex STC modifications, and should propose recommended actions to be taken by the FAA to address the effects complex structural STC modifications have on the structural integrity and continued safe operation of modified airplanes.

The report and recommendations should contain the following:

1. A description of FAA and industry actions necessary to identify the interaction effects of multiple complex STC modifications,

2. A description of FAA and industry actions that will address the effects that complex modifications have on aging aircraft issues, and

3. A description of FAA and industry actions necessary to address the effects that complex modifications have on FAA mandated airworthiness actions (i.e., airworthiness directives, aging aircraft programs).

Schedule: The report should be completed no later than September 28, 2002.

ARAC Acceptance of Tasks

ARAC accepted the task and assigned the task to the Airworthiness Assurance Working Group, Transport Airplane and Engine Issues. The working group will serve as staff to ARAC and assist in the analysis of the assigned task. ARAC must review and approve the working group's recommendations. If ARAC accepts the working group's recommendations, it will forward them to the FAA.

Working Group Activity

The Airworthiness Assurance 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 next meeting of the ARAC on transport airplane and engine issues held following publication of this notice.

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

3. Draft the appropriate documents and required analyses and/or any other related materials or documents the working group determines to be appropriate.

4. Provide a status report at each meeting of the ARAC held to consider transport airplane and engine issues. Participation in the Working Group The Airworthiness Assurance Working Group will be composed of technical experts having an interest in the assigned task. A working group member need not be a representative or a member of the full committee.

An individual who has expertise in the subject matter and wishes to become a member of the working group should write to the person listed under the caption FOR FURTHER INFORMATION CONTACT expressing that desire, describing his or her interest in the task, and stating the expertise he or she would bring to the working group. All requests to participate must be received no later than April 30, 2001. All requests will be reviewed by the assistant chair, the assistant executive director, and the working group chair. Individuals will be advised whether or not the request can be accommodated. Individuals chosen for membership on the working group will be expected to represent their aviation community segment and actively participate in the working group (e.g., attend all meetings, provide written comments when requested to do so, etc.). They also will be expected to devote the resources necessary to support the working group in meeting any assigned deadlines. Members are expected to keep their management chain and those they may represent advised of working group activities and decisions to ensure that the agreed technical solutions do not conflict with their sponsoring organization's position when the subject being negotiated is presented to ARAC for approval.

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

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

Meetings of the ARAC will be open to the public. Meetings of the 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. The FAA will make no public announcement of working group meetings.

Issued in Washington, DC, on March 14, 2001.
Anthony F. Fazio,
Executive Director, Aviation Rulemaking Advisory Committee.
[FR Doc. 01–7068 Filed 3–21–01; 8:45 am]
BILLING CODE 4910–13–M

On January 21, 2003, ARAC submitted their recommendations on complex STCs to the FAA. There were five recommendations included in the report to the FAA. The recommendations were:

Considering the conclusions reached by the AAWG, the AAWG recommends that the Aviation Rulemaking Advisory Committee (ARAC), Transport Airplane and Engine Issues Group (TAEIG) consider enacting the following five recommendations to ensure proper consideration of how an STC might interact and affect certification, aging airplane and continued airworthiness programs.

A. *The existing STC Limitations and Conditions template should be revised. The current wording implies that it is the installer's responsibility to ensure that the incorporated STC does not introduce any adverse effects on the airplane. It is the recommendation of the AAWG that this responsibility be placed with the Operator/STC holder/Installer. This includes configuration control, STC compatibility with actual airplane, and continued* *airworthiness in regard to the STC design and application. This will require a new 14 CFR 21 rule with a revision to AC 21-40, new operating rules with an advisory circular (AC), and a change to Order 8110.4b.*

B. *Require a special identification of complex STCs, where the installation may result in interaction effects with other STCs. The recommendation would require the determination of a complex STC by applicants for new STCs. This will require a new 14 CFR 21 rule, revision to Order 8110.4b and AC 21-40.*

C. *Establish a set of criteria to consider in evaluating interaction effects amongst complex STCs. This recommendation would require the development of an FAA Order and possibly some advisory material.*

D. *Require all STC applicants to provide information within the Instructions for Continued Airworthiness of the regions and areas affected by the proposed STC. This will require a new part 21 rule, possible revision to § 25.1529, Appendix H, revision to AC 21-40 and Order 8110.4b.*

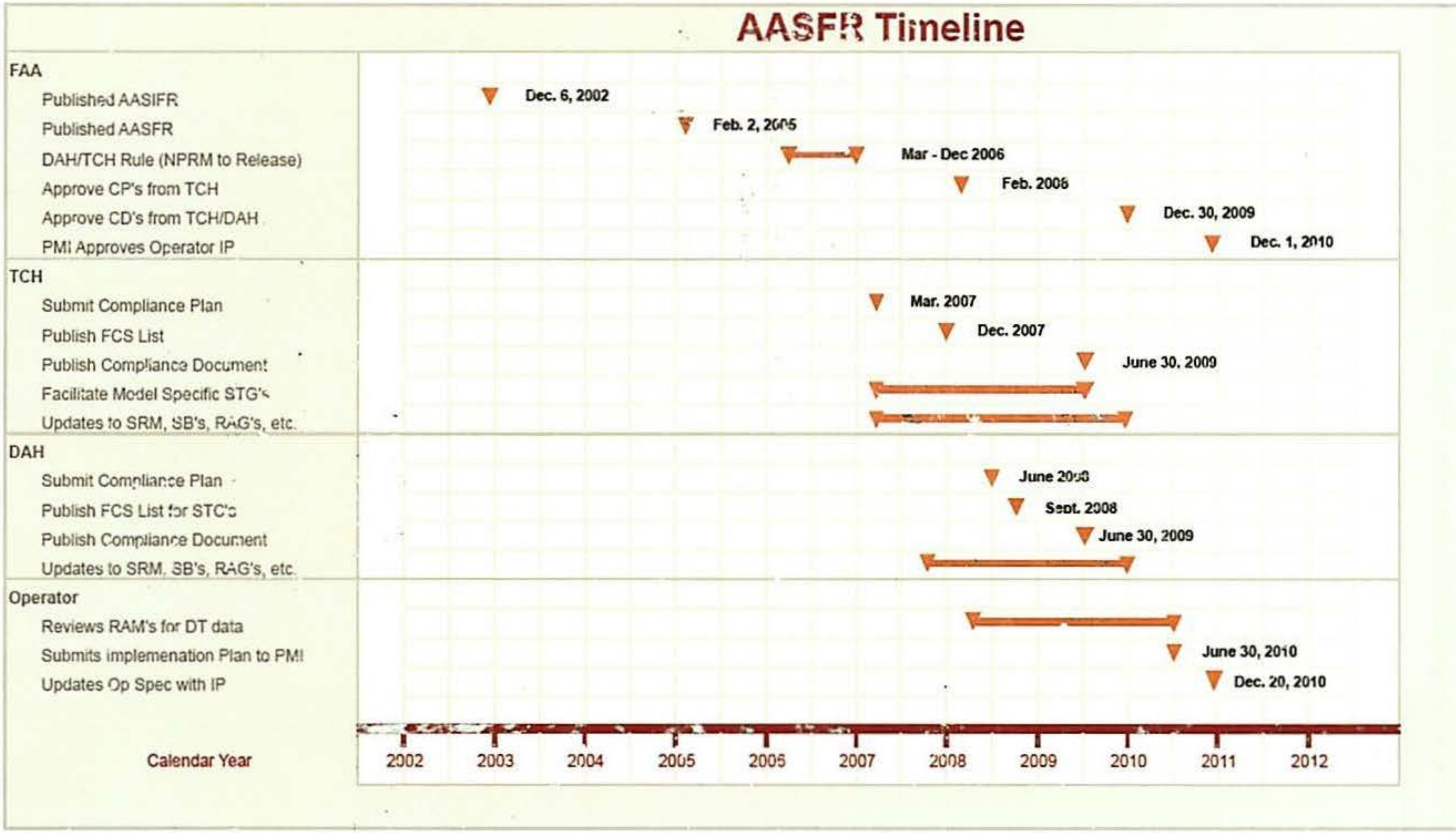
E. *The AAWG further recommends that the FAA conduct a Special Certification Review of those items (listed below) categorically classified as CSTCs to determine any additional maintenance actions required as a result of interactions not considered when the CSTC was installed:*
   a. *Hush kits,*
   b. *Winglets,*
   c. *Auxiliary fuel tanks,*
   d. *Re-engine,*
   e. *Weight increases,*
   f. *PAX cargo conversions*
   g. *Reinforced Flight Deck Doors*

F. *The AAWG recommends that the FAA and JAA regulations specific to certification and continued airworthiness of STCs and CSTCs be harmonized to the extent possible.*

These recommendations are comprehensive and address all of the issues found during the AAWG study of the subject, including the subject of STC interaction and are still strongly supported by the AAWG. The FAA is still considering how these recommendations will be enacted and therefore the AAWG defers any action on this subject of interaction of STCs to the FAA.

d) Program Timeline

One of the additional requests from the TAEIG was to identify a responsibility matrix for generation of data and a time line stipulating when the data is to be provided to various parties. At the time this report is being written, the rule requirements for the DAH (14 CFR 25.1823, 25.1825 and 25.1827) have not been published. The AAWG suspects that timelines for the development of data will be specified within the rule requirements that will be published. With that in mind, the AAWG has developed a timeline based on the way the advisory material was developed. This may or may not coincide with the dates and times that will be specified in the rule. Figure 1, provides the AAWGs view of the overall program timeline.



<u>Figure 1. Program Timeline</u>

2) Implementation Program for Alterations

There are fundamental differences between the recommendations for programs to implement Damage Tolerance requirements for alterations verses the implementation of Damage Tolerance requirements for repairs.

a) AAWG Findings on Alterations

The AAWG reviewed the similarities and differences between repairs and alterations and determined that there were nine basic differences between the two. These nine are listed in outline form below:

(1) Installations of alterations are generally planned events determined by business decisions repairs are not.
- Alterations generally have Engineering Order documentation for the installation of alterations.
- Repair installations are generally documented on non-Engineering Department paperwork.
- Repairs have a 12-month period to develop DT after installation, where alterations generally have the DT data at the time of installation.

(2) Record keeping and configuration control requirements make it more likely that an operator will have a record of existing alterations than a record of a repair.
- Operators have the ability to identify embodied alterations through a records retrieval process in lieu of waiting for a physical aircraft survey, similar to the repairs program. Thus alterations can have an accelerated compliance schedule when compared to repairs.

(3) Alterations have an added complexity of being able to affect FCS indirectly (e.g. loading/stresses).
- An intellectual review of the specific alteration is required to make a determination of how the alterations affects or creates FCS.

(4) Many alterations may have been developed and certified by non-TC holders.
- A process needs to be developed to involve the DAH for the specific alterations as opposed to the repairs program that mainly involved the TC holders.

(5) The DAH who holds the engineering data for an alteration may be unwilling or not available to support upgrading the alterations to DT standards.
- A process is required that will assure the development of the required data when the DAH is unwilling or unavailable to support their alteration.

(6) With some exceptions, alterations designed for and installed upon airplanes certified to 14 CFR Amendment 25-45 or later aircraft have DT data as part of their original certification.

(7) Regulators are not in a position to easily identify either alterations that have been installed or the owners of those alterations.
- Operators will need to identify the alterations embodied on their aircraft and the identity of the DAH. The operators can then provide that information to the regulators to enforce DAH compliance.

(8) The process used to identify FCS and the certification amendment level for determination of DT data should be the same for a given model type.

(9) The process of developing DT data for an alteration should be similar to the process used for an individual repair.
- Because of the uniqueness of alterations, the development of a RAP type document is technically difficult and therefore not considered here. Each alteration will be addressed on its own individual basis.

b) Industry Precedents

The AAWG reviewed the following resources to determine what information already exists that can be utilized for this tasking;
- Existing SSID ADs
- FAA SSID Standardization Team Report "Aging Aircraft Program SSID Review - Final Report-, September 2001
- RAP Documents
- AAWG Report on Supplemental Type Certificates, Reference 3c.

c) AAWG Actions

The AAWG accomplished the following tasks in order to determine an appropriate implementation schedule;
- Survey of industry alterations to determine the size and scope of this task.
- A review of industry resources that are DT qualified and available to support this effort.

d) Conclusions and Recommendations – Implementation Program for Alterations:

When determining how and when to incorporate DT for alterations, a clear distinction is made between those alterations where the DAH will support providing the DT data and those alterations where the DAH will not provide support. Additionally, in those expected rare situations where the operators' records system does not identify an alteration, a safety net is required. It is proposed that the aircraft survey for repairs be utilized to find any remaining unidentified alterations. In consideration of the number of potential alterations and industry resources that are available to assist operators in determining compliance, the following technical basis for the implementation program is proposed:

(1) DAH Support is Available

Where the DAH of the alteration is available to support it, the DAH can start that process in conjunction with the DAH rule (see timeline charts in previous section of this report). The Compliance Document, which contains the DT data, is anticipated to be available by December 2009. This date is within the recommendations of the FAA SSID Standardization Team Report (5years) and the SSID ADs (4-5 years) and provides a means for the operator to incorporate the DT data into their maintenance program by Dec 2010. Coordination is required between the DAH, operator and regulator to accomplish the following:

(a) Determine the embodied alterations;
(b) Communicate that information to the DAH and regulators;
(c) Determine the availability of DT data for each alteration;
(d) Develop and approve the DT data as required;
(e) Develop a means to provide the DT data; and,
(f) Define a means to implement the DT data into the operator maintenance program.

(2) DAH Support is not Available

Where DAH does not intend to comply with 14 CFR 25.1827 and provide assistance to the operators, the burden of developing the data will be placed on the operator. This situation may not be known before Dec 18, 2009. In this case a delayed compliance timeline is needed for the operator to develop or have that data developed. It is proposed that the timeline for development of the data for the oldest aircraft is within 3 years starting in December 2009. Further the timeline proposed for the younger aircraft is prior to 75% DSG. This timeline provides a phased approach to the development of the DT data that spreads out the work and reduces any bow wave effects that would adversely affect industry DT resources. This timeline is within the recommendations of the FAA SSID Standardization Team Report (5years) and the SSID ADs (4-5 years). Since a delayed compliance timeline is needed for this situation, the operator will provide a schedule of when the DT data would be available to their PMI in lieu of the actual DT data. The schedule would be called a "DT Development Schedule" and it would need FAA approval and incorporation in the approved maintenance program by the December 2010 compliance deadline. One of the provisions of the DT Development Schedule would be a clause that would prohibit the operation of the airplane past the scheduled due date of the DT data unless an approved addendum containing that data is added to the maintenance program.

(3) The Alteration Identified During the Repair Survey

In those rare situations when the operators have no record of an installed alteration, the repair survey will be utilized as a safety net to ensure no alterations are missed. It is proposed that a 24-month compliance period would be allowed to obtain and incorporate the DT data into the maintenance program. This is longer than 12-months allowed for repairs due the added complexity of determining the prior approval process for the alteration, identifying the DAH, and developing the DT data.

(4) Operators Implementation Plan

The operator's implementation plan (OIP) would be similar to that developed for repairs. The plan will contain a means to incorporate DT data that has already been developed and DT data that is yet to be developed.

3) The Effect Of Alterations On Baseline Structure

In order to make recommendations relating to damage tolerance based inspections for alterations embodied on FCS it was necessary to determine which categories of alterations would most likely need damage tolerance based inspections.

The DT evaluation to determine inspection requirements must include both an evaluation of the alteration itself and the interaction between the modification structure and the baseline fatigue critical structure. These interactions can be limited to the area immediately surrounding the modification or, depending on the alteration, can affect the baseline FCS more globally.

a) Alterations of Interest

A previous ARAC tasking relating to MCSTCs (Reference 3.c) investigated which factors can lead to an alteration being a concern beyond a localized area. These alterations were called "complex" if they:

- "Alters the design loads (static and/or fatigue) that affect a significant portion of the airplane structure, and/or
- Causes a change to the approved instructions for continued airworthiness, the Airplane Flight Manual and/or the Weight and Balance Manual. "

The report also listed some examples of "complex" alterations. Examples of these "complex" alterations are:

- Hush kits,
- Winglets,
- Auxiliary fuel tanks,
- Re-engine,
- Weight increases,
- PAX cargo conversions
- Reinforced Flight Deck Doors

Examples of non -"complex" alterations would be where the affect on FCS is local but could still be significant enough to require changes to the baseline DT based inspections. These included modifications that affect splices or which add skin cutouts.

Additional guidance of which alterations are of most concern is provided in AC 25.571-1c with reference to prevention of WFD. While these criteria have been identified in the section devoted to WFD, they are in fact appropriate for durability issues associated with alterations. These criteria include the consideration of the following issues and their affect on the DT based maintenance inspections:

- Distribution of stresses in the underlying structure
- How loads in other parts of the airplane are affected
- The effect of a change in the basic utilization of the airplane due to the alteration
- The alteration may have changed the inspectability of the structure

Since the list of alterations was published in the Reference 3.k report additional changes were made relating to antenna doublers, interior mass items, and nacelles.

(1) Addition Of The Antenna Doubler Installations To The List Of Alterations.

The MCSTC report identified antennas as sometimes being significant and may adversely affect the inspection requirements for the baseline structure. A recent survey of operators regarding alterations confirmed that antenna installations were common. While many of these installations were small, the AAWG concluded that antennas had sufficient potential for affect on FCS to merited addition to the list because of the following issues:

- Additional loading induced through aerodynamics or inertia
- Hidden cracking in the now covered baseline structure.
- Initiation of cracking in the baseline structure.
- Degradation or cracking in the antenna structure.

(2) Addition of Interior Mass Items (Monuments)

The AAWG concluded that addition or modification of items of mass in the interior space of the airplane was necessary. These alterations are of interest because of the potential for significant addition to the inertial loading from the connection of these mass items to baseline FCS.

(3) Removal Of Nacelles From The List

The AAWG decided to remove nacelles from the list of alterations to be considered. This was done because alterations done to the nacelle generally are part of a larger class of alterations including engine/pylon replacements or hush-kit installations. If any of these alterations were performed, the applicant would need to define the FCS, including nacelles as appropriate, and develop the required data for compliance.

b) Creation of FCS

Alterations that modify the structure introduce new structural elements that may contain fatigue sensitive details, like fastener holes. These elements will need to be assessed to determine if they classify as FCS. Guidance for such an evaluation is provided in AC 25.571-1c. Not all structural elements added as a result of an alteration will be classified as FCS. There are two different issues to be considered.

(1) The Alteration Itself

The design of the alteration may contain details that introduce FCS.

(2) Existing Baseline Structural Elements May Be Directly Affected By The Alteration.

New fatigue sensitive details may be created by the alteration. This is the case for cutouts applied in fuselage skins, or fastener holes in frames. When the affected structural element is already identified as a FCS, the newly created details should be assessed. New maintenance actions may be required to ensure continued airworthiness.

c) Alterations to Removable Structural Components

AC120-AAWG provided guidance for DT data development and implementation for existing and new repairs to fatigue critical structure. The AAWG identified the need for guidance on how to track DT inspections at a component level, as opposed to an aircraft level, for those components that can be moved from one airplane to another. In summary, the guidance covered:

- Tracking removable components that containing fatigue critical structure.
- Methods and schedules for developing and implementing DT data for repairs to removable components containing fatigue critical structure.
- Implementation options for removable components containing fatigue critical structure.
- Methods of determining or assigning the age (hours/cycles) to a removable structural component when its original life history is unknown.

The guidance provides an acceptable means for an operator to comply as agreed with their PMI.

Conclusions:
The AAWG concludes that the AC guidance developed for repairs to rotable components is also applicable for alterations to rotable components.

Recommendations:
The combined AC for repairs and alterations (Appendix B of this report) contains language that provides guidance applicable to both repairs and alterations.

d) Instructions for Continued Airworthiness for Removable Structural Components:

The AAWG reviewed the industry status of various programs that contain Instructions for Continued Airworthiness (ICAs) such as Fatigue Damage, Environmental Damage, Accidental Damage, Airworthiness Directives, Repairs and Alterations. The review identified the lack of consistency in the industry with respect to tracking these ICAs on baseline structure at an aircraft level versus component level. Table 1 summarizes the AAWG findings of Various ICA Programs for Rotables.

Conclusions:
The AAWG concluded;

- It is not part of our current tasking to address this issue.
- Compliance with the various types of ICA programs is currently achieved via local processes between the operator and their PMI.
- In general, the industry has processes and does individually track components with ICAs for safe life components and ADs, and does maintain those ICAs when components are transferred.
- Historically, the industry has not individually track components with ICAs for fatigue, environmental, and accidental damage.
- The industry generally does not provide repair or alteration status, or their applicable ICAs, as components are transferred throughout the industry.

Recommendations:
The AAWG recommends industry wide involvement to resolve the following generalized issues:

- Which ICAs can be tracked on an aircraft level vs. a component level?
- A process to maintain the various ICAs on removable structural components as they are transferred through out the industry.
- A process to bring existing components up to a component level tracking standard. That process would need to include;
    - Methods of determining or assigning the age (hours/cycles) to a removable structural component when its original life history is unknown.
    - Methods to assign serialization to components that were not originally anticipated to require it.

Types of ICA programs	Specific Programs	Comments Regarding Components	Generalized Industry Status	Comments	AAWG recommendations & suggestions
Fatigue Damage (FD)	Baseline MX Programs (MRB MPD)	No industry standard for tracking baseline programs at the component level.	The industry generally DOES NOT provide status as components are transferred throughout the industry.	Tracking of components for FD is necessary. This is easier to do for new aircraft, and very tough to do as a catch up plan for existing aircraft.	This issue is beyond the tasking of the AAWG
	WFD				
	SSID / ALI				
	Safe Life Parts	Tracking is controlled from birth.	Safe life parts are being tracked from birth.	Safe Life components require tracking. These parts are identified at delivery which makes tracking easier.	No further action is needed
Airworthiness Directives	Individual ADs.	Requires specific compliance for each component.	The industry generally DOES provide AD status (on 8130s) as components are transferred throughout the industry.	No further action is needed	No further action is needed
Repairs	DT	Any post repair ICAs requires compliance for each component.	The industry generally DOES NOT provide repair status (on 8130s) as components are transferred throughout the industry.	Need a program to bring existing components up to the documentation requirements (121.1109, 121.1107, 25.1823, 25.1825, 25.1827), then need a industry wide program to maintain this level of documentation as components move throughout the industry.	Provide a means, like the AAWG has in the AC, that permits an operator to comply on an individual basis with his PMI. Any industry tracking/documentation issues are beyond the tasking to the AAWG.
Alterations	DT	Any post alteration ICAs requires compliance for each component.	The industry generally DOES NOT provide alteration status (on 8130s) as components are transferred throughout the industry.	Need a program to bring existing components up to the documentation requirements (121.1109, 121.1107, 25.1825, 25.1827), then need a industry wide program to maintain this level of documentation as components move throughout the industry.	Provide a means, like the AAWG has in the AC, that permits an operator to comply on an individual basis with his PMI. Any industry tracking/documentation issues are beyond the tasking to the AAWG.
Environmental Damage (ED)	Baseline MX Programs (MRB MPD)	No industry standard for tracking baseline programs at the component level.	The industry generally DOES NOT provide status as components are transferred throughout the industry.	In general, component tracking is not necessary for ED or AD programs. Recommend MRB statements as such.	This issue is beyond the tasking of the AAWG
	CPCP				
Accidental Damage (AD)	Baseline MX Programs (MRB MPD)	No industry standard for tracking baseline programs at the component level.			

Table 1 – Overview of ICA programs for Rotable Components

e) The Possibility Of A Deactivated Alteration That Might Not Exist On Configuration Documents

The AAWG considered deactivated alterations that may not exist in maintenance records. The situation is likely to be rare and would most likely occur with aircraft that had been transferred between different operators.

While airplane transfer requires the new operator to be provided with embodiment and configuration documentation for all major alterations this does not always occur especially when an alteration has been deactivated.

There are three principal situations where an operator may not be aware that a deactivated alteration exists.

- Where the alteration is totally removed, but has resulted in changes to the baseline structure e.g. fastener holes, trim outs.
- Where the alteration has been partially removed and some elements of the alteration remain installed on the baseline structure.
- Where the alterations purpose is no longer required however it has been left installed.

The AAWG recommends operators survey the airplane for deactivated alterations while accomplishing the airplane repair survey. Operators would need to include procedures in the model specific OIP on how to handle these alterations. This would include a survey of the airplane for these alterations during the repair survey. Operators would also need include a method to develop DT data and incorporate it into their maintenance program.

4) DAH/FAA/Operator Involvement

The interaction between the DAH, FAA and Operator is far more complicated and complex for alterations then it is for repairs. This is because of the way alterations are certified and installed on airplanes. This subject is discussed further in the AAWG report on MCSTCs (Reference 3.c). With repairs, the TC Holder is most likely to be the entity that holds the engineering data for a particular model airplane. For alterations, the engineering data is held by the DAH, whose identity may only be known by the operator who installed it. Therefore it is more likely the DAH will be known by the operator than the regulator. In order for the FAA to implement 14 CFR 25.1827, the operator will need to assist the FAA in determining the DAH for each of the alterations installed. It is proposed that the following approach is utilized in engaging the DAH for alterations.

a. The operator would review their records to determine which alterations were installed on his fleet. He would note the tail numbers and the name and address of each DAH.

b. Operators would then contact the DAH of applicable alterations of record that exist on his fleet of airplanes to ascertain whether or not the alterations affect or create fatigue critical structure and if so, verify that the appropriate DT data exists for those alterations.

c. The operators will need to provide a list of applicable alterations on their active fleet to the FAA. The lists shall contain information relative to the DAH for each alteration. From this list the FAA can notify the DAHs of their responsibility for supporting their alteration per 14 CFR 25.1827.

d. In those situations where the DAH no longer exists or is unwilling to comply with the request, it becomes the responsibility of the operator to develop the data using the guidance contained in AC 120 AAWG. Operators need to determine this in a timely manner so that they can begin the task of obtaining the required DT data. AC 120.AAWG provides tasks the operator should follow to develop the required DT data.

e. To ensure the complete and timely flow of data to and from the FAA, the FAA should examine their existing method of handling correspondence, and develop a new means as appropriate for this activity. To ensure that the new process is accomplished properly, appropriate training should be given to the applicable personnel prior to beginning this activity.

f. There needs to be an open communication between the FAA, the DAH and the operators concerning the intent of the DAH to support compliance. To facilitate this communication the FAA should develop an electronic method of notifying the operators concerning the status of DAH support for the alteration installed.

5) Alterations Without DT Based Inspection Programs.

The FAA should consider training of their PMIs to prevent the installation of already approved alterations on Transport Category Airplanes operated under 14 CFR 121 and 129 after December 20, 2010, without an FAA approved maintenance program addendum that contains DT based inspections.

6) Analysis and Documentation Issues

a) Alterations Will Need To Be Evaluated Individually

Alterations are normally performed on an airplane to add certain functionality not available when delivered by the TCH. Therefore alterations are likely to be unique to ensure those different functionalities. Further, various alterations may be designed to different standards that the original type design for a variety of reasons and may vary from one airplane to another due to different baseline design. Also alterations might alter the structure significantly (e.g. Cargo Door, winglet, MTOW increase,) and the impact on the baseline structure in a manner that is not easily predictable.

Therefore alterations are not comparable to repairs, where standardized practices have been used to define a RAG to cover specific repairs on certain baseline structure. Because of the variety of alterations no standardized approach is possible to establish a RAG for this subject.

b) Certification Level To Be Used

As for the repairs, an alteration should not degrade the level of safety of the baseline structure. Therefore all alterations shall be certified to the same amendment level as the baseline structure (minimum 14 CFR Amendment 25-45) or in case of Major Change even to a higher level.

c) Alteration Compliance Document

As described above, alterations are naturally quite different from each other and might also be quite large in size or could have an adverse effect on the baseline structure. Therefore if the alteration has an influence on existing FCS or creates new FCS, the maintenance program may require extensive revision.

For example, a MTOW increase would need to establish a completely changed maintenance program, consisting of a supplemental ALI and a review other in-service manuals such as the SRM. Therefore depending on the change incorporated by the alteration, a complete or partial review and update of all documents might be necessary to demonstrate compliance to 14 CFR 121.1109 and 129.109.

B. Action on AC 25.1529-1

In approving the results of the Phase 1 activities, the TAEIG requested that the AAWG review and provide comment to the following issue:

> **One member of the TAEIG wants to retain 25.1529 since some airplanes, not effected by the AASFR rely on it's guidance. The AAWG has an action to review the recommendation.**

The AAWG has reviewed its position on TAEIG Query number 3 and concurs that AC 25.1529-1 should not be rescinded. A copy of this AC with proposed changes to make its effectivity clear is included as Appendix C of this report.

3. Conclusions and Recommendations

The AAWG has revised draft AC 120-AAWG to include the process for assessing both repairs and alterations to fatigue critical structure using damage tolerance principles. The proposed AC addresses repairs and alterations to both baseline structure as well as repairs to alteration and modifications. The AAWG believes that the proposed AC 120-AAWG contains sufficient guidance for all DAHs to develop a Compliance Document which would support operator compliance with the AASFR for repairs and alterations.

Key to initiating this process is the identification of fatigue critical structure for each applicable airplane model. Repairs and alterations to the fatigue critical structure will need to be assessed for damage tolerance. Depending on the certification level of the aircraft model and whether installed repairs and alterations are already covered by DT data, this may require a survey of the aircraft.

Conclusions:

1. A survey of 10 operators revealed that there are approximately 246 alterations installed on the active commercial fleet. Of the 246, 171 did not have DT data, and 24 of the 171 were deemed complex.

2. The conclusions and recommendations contained in the AAWG report on MCSTCs are still strongly supported by the industry. Those conclusions and recommendations address issues with complex STCs which are still being considered by the FAA. Any action on complex STCs is therefore deferred to the FAA and their deliberations.

3. Operators are required to keep permanent records of alterations installed on their aircraft where requirements for record keeping for repairs may only extend to the next major maintenance visit.

4. Once an alteration is approved for installation, operators may purchase alterations from their owners and install them on their fleet. The data package may or may not have DT data included.

5. The engineering support of an alteration is the responsibility of the DAH and extends to the provision of DT data for continued airworthiness. In the absence of the DAH, the responsibility falls to the operator.

6. The process for compliance for alterations is dependant upon timely communications between the FAA, DAH and operators and consistent application of standards by the FAA.

7. Implementation Plans for Alterations

a. Installed alterations are a matter of record with a particular airline and therefore implementation plans can be handled differently than repairs.

b. Implementation plans for alterations are dependant on the willingness or availability of DAH to support the alteration with DT data, if required.

c. There is a possibility that deactivated alterations exist on an airplane that are not part of the records that an operator holds. In these cases, the repairs survey would be used to reveal these deactivated alterations for appropriate action.

8. Rotable Components

a. Alterations to rotable components can use the same guidance developed for repairs to rotable components contained in the original issue of AC 120-AAWG.

b. Based on an EASA request, the AAWG concluded that there was a potential issue with the tracking of rotable components in the industry, however we were not tasked to consider this.

9. Analysis of Alterations for DTA

a. The DT data for an alteration must include both an assessment of the new FCS added by the alteration and it's affect both locally and globally on the baseline FCS.

b. Because alterations tend to be unique, DT data will need to be developed for each unique installation. The use of RAG type programs may not be feasible.

c. For existing alterations that require a new DTE, the DAH should use 14 CFR 25.571 at Amendment 45 or the certification basis of the airplane whichever is greater.

d. Dependant on the scope of the modification, the applicant may need to revisit published documents such as the SRM to insure that the information is still valid.

Recommendations

1.0 The AAWG Recommends that AC 120-AAWG be promulgated as a means of compliance to 14 CFR 121.1109 and 129.109 with respect to repairs and alterations. A copy of this AC is contained in Appendix B.

2.0 The AAWG recommends that operators keep records on repairs that affect Fatigue Critical Structure.

3.0 The FAA provide adequate direction and training to it's ACO and Flight Standards staff to ensure that there is uniformity in the administration of these regulations across the industry.

Appendix A: Copy of FAA Tasking Notice

Federal Register / Vol. 69, No. 93 / Thursday, May 13, 2004 / Notices

Pages 26641 through 26644

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

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

AGENCY: Federal Aviation Administration (FAA), DOT.

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

SUMMARY: The FAA assigned the Aviation Rulemaking Advisory Committee a new task to develop guidance that will support industry compliance with the Aging Airplane Safety Final Rule requirements that relate to supplemental structural inspections. This new tasking will also address certain aspects of recommendations made during a previous ARAC tasking related to widespread fatigue damage. This notice is to inform the public of this ARAC activity.

FOR FURTHER INFORMATION CONTACT: Mike Kaszycki, Federal Aviation Administration, Transport Standards Staff, 1601 Lind Avenue, SW., Renton, Washington 98055–4056, *mike.kaszycki@faa.gov.*

SUPPLEMENTARY INFORMATION:

Background

The FAA established the Aviation Rulemaking Advisory Committee to provide advice and recommendations to the FAA Administrator on the FAA's rulemaking activities with respect to aviation-related issues. This includes obtaining advice and recommendations on the FAA's commitments to harmonize Title 14 of the Code of Federal Regulations (14 CFR) with its partners in Europe and Canada.

Airplane Applicability of Tasking

This new tasking shall apply to transport category airplanes with a type certificated passenger seating capacity of 30 or greater, or a maximum payload capacity of 7,500 pounds or greater, operated under part 121 or under part 129 (U.S. registered airplanes).

Statement of Tasking

There are four major tasks to be completed under this tasking:

Task 1.—Repairs to Baseline Primary Structure and Repairs to Alterations and Modifications

Draft an Advisory Circular (AC) that contains guidance to support the following two paths of compliance with §§ 121.370a and 129.16 of the Aging Airplane Safety Interim Final Rule (AASIFR):

1. *Damage-tolerance-based inspection program developed by part 121 and 129 certificate holders:* Develop guidelines and procedures that will enable part 121 and 129 certificate holders to develop a damage-tolerance-based inspection program that addresses repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

2. *Model specific damage-tolerance-based inspection program:* Develop Guidance that can be used by Type Certificate (TC) holders, Supplemental Type Certificate (STC) holders, and Structural Task Groups to support the development of a model specific damage-tolerance-based inspection program. The model specific damage-tolerance-based inspection program will address repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The developed model specific inspection program will support part 121 and 129 certificate holders' compliance with the AASIFR.

A written report will also be submitted that includes an action plan for the implementation of the recommendations of task 1 that will be addressed in task 4 below. The report is to be submitted to the Aviation Rulemaking Advisory Committee (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.

In the process of drafting the AC, the ARAC should assess the effectiveness of AC 91–56B to provide guidance to TC and STC holders for developing damage-tolerance-based inspections and procedures for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The ARAC should do the following:

• Assess the effectiveness of AC 91– 56B to support industry compliance with the AASIFR with respect to repairs.

• Document any improvements to the AC that would provide better direction with respect to the guidance for TC and STC holders in their development of damage-tolerance-based inspections and procedures for repairs.

The ARAC is requested to validate that the guidance material in the new AC will result in programs that provide a high degree of autonomy for part 121 and 129 certificate holders while supporting compliance with the AASIFR. In order to determine a rational approach for addressing repairs to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, and are not currently covered by a mandated program, the AC should provide guidance to the part 121 and 129 certificate holders and to the type certificate holder to address the seven issues listed below.

1. The significance of the airplane certification amendment level in providing direction for the development of damage tolerance inspections and methods for repairs.

2. The degree to which Supplemental Structural Inspection Documents/ Programs (SSID/P) or equivalent documents/programs provide direction to repair the structure using damage-tolerance-rated repairs. The assessment should apply to SSID/Ps or equivalent documents/programs developed for 14 CFR part 25 pre-amendment 25–45 transport airplane models having a maximum gross takeoff weight of 75,000 lbs or greater. The following should be identified:

• Areas of aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by SSID/ Ps or equivalent documents/programs

• Significant assumptions applied in developing SSID/Ps or equivalent documents/programs

• Any significant issues in the implementation of the requirements of SSID/Ps or equivalent documents/ programs

• Data from SSID/Ps or equivalent documents/programs that would be useful in supporting this new tasking

3. The degree to which an applicable airplane model's Airworthiness Limitations Section (ALS) provides direction to repair the structure using damage-tolerance-rated repairs. This assessment should apply to damage-tolerance-based inspection programs/ data developed for 14 CFR part 25 amendment 25–45 or later transport airplane models having a maximum gross takeoff weight of 75,000 lbs or greater. The following should be identified:

• Areas of aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by a damage-tolerance-based inspection program/data

• Any significant issues in the implementation of the requirements of the damage-tolerance-based inspection programs/data

• Data from the damage-tolerance-based inspection programs that would be useful in supporting this new tasking

4. The degree to which existing Repair Assessment Guideline documents developed for §§ 121.370 and 129.32 provide damage-tolerance-based inspections for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The assessment should identify the following:

• Areas of the aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by these documents

• Data from these documents that would be useful in supporting this new tasking

5. Identify the issues/difficulties industry has encountered with establishing damage-tolerance-based inspections and procedures for repairs as required by various FAA approaches in issuing SSIP airworthiness directives (*e.g.*, 727/737 AD 98–11–03 R1,

AD 98– 11–04 R1 verses other SSIP AD approaches like the 747). The assessment should identify the following:

• Comparison of approaches with pros and cons for each approach

• Data from these documents that would be useful in supporting this new tasking

6. Assess the extent to which Structural Repair Manuals (SRM) provide damage-tolerance-based inspections for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

7. Assess the need to include damage-tolerance-based inspections and procedures in TC and STC Holder issued Service Bulletins (SB) that provide repair instructions for aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

Task 2.—Alterations and Modifications to Baseline Primary Structure, Including STCs and Amended Type Certificates (ATCs)

Prepare a written report assessing how an operator would include damage tolerance-based inspections and procedures for alterations and modifications made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. This assessment would include, but is not limited to, alterations and modifications performed under an STC, ATC. FAA field approval (*e.g.*, FAA form 337) and/or FAA approved TC holder design data. The report should include a recommendation on the best means to develop damage-tolerance-based inspections and procedures for these alterations and modifications and the applicability of AC 91–56B. The ARAC should assess the effectiveness of AC 91–56B to provide guidance to STC holders for developing damage-tolerance-based inspections and procedures for alterations and modifications. The ARAC should do the following:

• Assess the effectiveness of AC 91– 56B to support Industry compliance with the AASIFR with respect to alterations and modifications.

• Document any improvements to the AC that would provide better direction with respect to the guidance for STC holders in their development of damage-tolerance-based inspections and procedures for alterations and modifications.

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 should also provide a recommendation on the means of compliance provided by the AC developed in Task 1 in regards to repairs installed on STC or ATC approved alterations and modifications. 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 (FAA concurrence is necessary to ensure actions will support industry compliance with the AASIFR).

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.

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 the 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.

Schedule

The tasking will be performed in two phases. In Phase 1, the ARAC will provide to the FAA the results of Tasks 1 through 3. Phase 1 should be accomplished by December 16, 2005. In Phase 2, the Structures Task Groups, under the direction of the ARAC, should produce the model specific guidance material, Task 4, using the guidelines and procedures of the AC produced in Phase 1. The ARAC will be responsible for coordinating and overseeing the STG's application of the AC. Phase 2 documents should be completed by December 18, 2009.

ARAC Acceptance of Task

ARAC accepted the task and assigned the task to the Airworthiness Assurance Working Group, Transport Airplane and Engine Issues. The Structural Task Groups (STG) composed of type certificate and part 121 and 129 certificate holders familiar with the specific model aircraft will support the working group. The working group will serve as staff to ARAC and assist in the analysis of the assigned task. ARAC must review and approve the working group's recommendations. If ARAC accepts the working group's recommendations, it will forward them to the FAA.

Working Group Activity

The Airworthiness Assurance Working Group must comply with the procedures adopted

by ARAC. As part of the procedures, the working group must:

1. Recommend a work plan for completion of the task, including the rationale supporting such a plan for consideration at the next meeting of the ARAC on transport airplane and engine issues held following publication of this notice.

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

3. Draft the appropriate documents and required analyses and/or any other related materials or documents.

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

Participation in the Working Group

The Airworthiness Assurance Working Group will be composed of technical experts having an interest in the assigned task. A working group member need not be a representative or a member of the full committee. If you have expertise in the subject matter and wish to become a member of the working group you should write to the person listed under the caption **FOR FURTHER INFORMATION CONTACT** expressing that desire, describing your interest in the task, and stating the expertise you would bring to the working group. We must receive your request to participate no later than May 28, 2004. The assistant chair, the assistant executive director, and the working group chair will review your request and will advise you whether your request is approved. If you are chosen for membership on the working group, you must represent your aviation community segment and actively participate in the working group (*e.g.*, attend all meetings, provide written comments when requested to do so, *etc.*). You must also devote the resources necessary to support the working group in meeting any assigned deadlines. You must keep your management chain and those you may represent advised of working group activities and decisions to ensure that the proposed technical solutions don't conflict with your sponsoring organization's position when the subject being negotiated is presented to ARAC for approval.

Once the working group has begun deliberations, members will be added or substituted only with the approval of the assistant chair, the assistant executive director, and the working group chair.

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

Meetings of the ARAC will be open to the public. Meetings of the 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. The FAA will make no public announcement of working group meetings.

Issued in Washington, DC, on May 4, 2004.

Anthony F. Fazio,

Executive Director, Aviation Rulemaking Advisory Committee.

[FR Doc. 04–10816 Filed 5–12–04; 8:45 am]

BILLING CODE 4910–13–P

Appendix B: Draft AC 120-AAWG

FEDERAL AVIATION ADMINISTRATION

Advisory Circular

Subject: DAMAGE TOLERANCE INSPECTIONS FOR REPAIRS AND ALTERATIONS	**Date:** Draft **Initiated by:** ANM-100 and AFS-300	**AC No:** 120-XX Rev 3A March 9, 2006

1. PURPOSE.

a. This Advisory Circular (AC) provides guidance material for design approval holders (DAH) and operators for developing and incorporating Damage Tolerance Inspections and Procedures. This AC supports DAH compliance with 14 Code of Federal Regulations (14 CFR) 25.1823, Supplemental Structural Inspections, Holders of type certificates – Repairs, 14 CFR 25.1825, Supplemental Structural Inspections, Holders of type certificates – Alterations and repairs to alterations, 14 CFR 25.1827, Supplemental Structural Inspections, Holders of and applicants for a Supplemental type certificate – Alterations and repairs to alterations and operator compliance with 14 CFR 121.1109 and 14 CFR 129.109, the Aging Airplane Safety Final Rule (AASFR) with respect to repairs and alterations. This AC is applicable to repairs and alterations to structure susceptible to fatigue cracking that could contribute to a catastrophic failure. For the purposes of this AC, the term "alteration" is used to describe a design change and encompasses the term "modification." This AC refers to that type of structure as fatigue critical structure.

b. This AC also provides guidance for new and existing repairs and alterations made to the as original, delivered, airplane structural configuration, as well as repairs to alterations. For compliance with § 121.1109 and § 121.109, operators will need to demonstrate that new and existing repairs and alterations will have an evaluation and damage tolerance based inspections or other procedures implemented if needed.

2. APPLICABILITY.

a. The guidance provided in this AC is applicable to type certificate (TC) holders, supplemental type certificate (STC) holders, Design approval holders (DAH) and operators of transport category airplanes with a type certificated passenger seating capacity of 30 or greater, or a maximum payload capacity of 7,500 pounds or greater.

The applicability is limited to airplanes operated under Parts 121 or 129 (US Registered Airplanes).

b. Like all AC material, this AC is not, in itself, mandatory, and does not constitute a regulation. It describes an acceptable means, but not the only means, for showing compliance with the requirements for transport category airplanes. The Federal Aviation Administration (FAA) will consider other methods of showing compliance that an applicant may elect to present. While these guidelines are not mandatory, we derived them from extensive FAA and industry experience in showing compliance with the relevant regulations. On the other hand, if we become aware of circumstances that convince us that following this AC would not result in compliance with the applicable regulations, we will not be bound by the terms of this AC. We may require additional substantiation or design changes as a basis for finding compliance.

c. This material does not change, create any additional, authorize changes in, or permit deviations from, regulatory requirements.

d. Terms in this AC, such as "shall" or "must" are used only in the sense of ensuring applicability of this particular method of compliance when the acceptable method of compliance described herein is used. While these guidelines are not mandatory, they are derived from FAA and industry experience in determining compliance with the pertinent regulations.

[Draft AC/Signature Remove before posting]

TABLE OF CONTENTS

CHAPTER 1. DAMAGE TOLERANCE

100. DAMAGE TOLERANCE INSPECTIONS AND PROCEDURES, DAMAGE TOLERANCE EVALUATION PROCESSES (DTE PROCESSES) AND DAMAGE TOLERANCE DATA (DT DATA).

a. The term Damage Tolerance Inspections and Procedures used in the Aging Airplane Safety Final Rule (AASFR) is synonymous with the term damage tolerance data (DT data) used in this AC. These damage tolerance inspections (DTI) for repairs and alterations supplement existing airworthiness authority - approved maintenance programs, including those contained in the instructions for continued airworthiness (ICA), scheduled maintenance programs, supplemental structural inspection programs (SSID) and airworthiness limitation items (ALI) programs, Service Bulletins (SB), and Repair Assessment Programs (RAP).

b. Amendment 25-45 to 14 CFR Part 25 introduced the use of damage tolerance principles. This approach requires an evaluation of the structure to determine its crack growth and residual strength characteristics. The evaluation supplies the information necessary to determine a maintenance plan for continued airworthiness. For this AC, the term damage tolerance evaluation (DTE) processes refers to an approved process, that includes, analysis and/or tests and service data, that leads to a determination of a continuing airworthiness maintenance plan, including inspections (i.e., DTI), or other procedures for a repair/alteration or replacement of fatigue critical structure. Consistent with the guidance provided by this AC, a DTE process could entail anything from a rigorous analysis methodology for use by a structures analyst to generic guidelines for operator use. This process will enable a survey and assessment of existing repairs and alterations to be made. In this AC, the term "DT data" means DTE documentation and DTI. Damage tolerance evaluation documentation means data that identifies the evaluated fatigue critical structure, the basic assumptions applied in a DTE, and the results of a DTE. Use of the term "DTI" in this AC means inspections and other procedures developed as a result of a DTE.

c. The DTE processes typically result in four items that comprise the DTI. Those are as follows:

- Where to inspect.
- When to start inspecting.
- How to inspect.
- How often to repeat the inspection.

d. For some airplane models, the requirements of the AASFR are beyond the scope of the original certification level. For these airplanes, development of DT data and incorporation of that data into the existing maintenance programs are required. For other models, there are DT data included in various documents, for example SSIDs, repair assessment guidelines (RAGs), airworthiness limitation sections (ALSs), structural repair manuals (SRMs), and airworthiness directives (ADs). These documents will need to be reviewed to determine if sufficient data exists to satisfy the requirements of the AASFR. In any case, an operator may use these DT data in part or in whole to support compliance with the requirements of the AASFR for repairs and alterations.

e. Sometimes, the results of the DTE process may indicate that inspections are either impractical or unreliable. In such cases, the continued airworthiness of the airplane is assured by establishing a replacement time for the repair or alteration.

101. OVERVIEW OF DT DATA DEVELOPMENT AND INCORPORATION.

a. Developing DT data involves accomplishing tasks typically performed by a DAH, assisted by interested operators. The product is an FAA approved, model specific Compliance Document or other service information (e.g. Service Bulletin) that contains the DT data required for compliance. Incorporation of the DT data into a maintenance plan involves accomplishing tasks that are typically performed by an operator. The product is an FAA-PMI approved airplane specific Operator Implementation Plan.

b. Design approval holders, operators and regulators should develop model specific Compliance Documents with oversight provided by aviation airworthiness authorities and the Aviation Rulemaking Advisory Committee's (ARAC) Airworthiness Assurance Working Group (AAWG).

c. The following is a summary of the tasks necessary to develop DT data for repairs and alterations and incorporate it into an operator's maintenance program:

(1) Design approval holder Tasks - Repairs. The following is an overview of the tasks for repairs that are further developed in Chapter 2 of this AC. These tasks are normally the responsibility of the type certificate (TC) holder.

(a) Identify the affected airplane model, models, or airplane serial numbers to which the DT data will apply.

(b) Identify the fatigue critical structure.

(c) Identify the certification level.

(d) Review of existing DT data.

(e) Develop additional DT data.

(f) Establish Implementation Schedule.

(g) Prepare Compliance Document. This is a model or airplane specific document that contains the information from Paragraphs (a) through (f) above. The operator will use this document to develop an implementation plan for complying with the AASFR. In order to support operator compliance to the AASFR, the DAH should submit the Compliance Document to the FAA Oversight Office for approval and should make it available to operators by December 18, 2009.

(2) Design approval holder Tasks - Alterations. The following is an overview of the DAH Tasks that would be done for Alterations and are further developed in Chapter 3.

(a) Obtain data from the type certificate (TC) holder or the operator relative to each applicable model concerning the identification of fatigue critical structure and certification level. Alternately the DAH may wish to develop his own data.

(b) Establish a list of candidate Alterations that may have been embodied on fatigue critical structure and/or have design details that could be classified as fatigue critical structure.

(c) In consultation with operators (See below), determine which airplane models the alteration(s) has been installed on.

(d) Identify applicable alterations
- Alterations that affect fatigue critical baseline structure
- Alterations that create fatigue critical structure

(e) Determine if DT data exists for the identified alterations.

(f) Develop additional DT data.

(g) Establish Implementation Schedule.

(h) Prepare a Means of Compliance. This means of compliance can be an alteration specific document (e.g. Service Bulletin, Compliance Document, or Amended STC) that contains the information from Paragraphs (a) through (g) above. The operator will use this document to develop an implementation plan for complying with the AASFR. In order to support operator compliance to the AASFR, the DAH should submit the Compliance Document to the FAA Oversight Office for approval and should make it available in accordance with 14 CFR 25.1825 or 25.1827 as applicable.

(3) Operator Tasks – Repairs and Alterations. The following is an overview of the operator tasks that are further developed in Chapter 4.

(a) Review the applicable Compliance Documents.

(b) Obtain or Develop additional DT data for alterations.

(i) Identify applicable alterations that exist in the operator fleet that have been embodied on Fatigue Critical Baseline Structure.

(ii) Identify and contact the DAH for the applicable alteration and request DT data for the alteration. If the DAH no longer exists or is unwilling to comply with this request it becomes the responsibility of the operator to develop the DT data using the guidance contained in Chapter 3.

(iii) Review the DAH compliance documents.

(c) Develop an Operators Implementation Plan. This is specific to the identified airplane or group of airplanes in the implementation plan and contains information from Paragraphs 101(1)(g), 101(2)(h) and/or 101(3)(b) of this AC.

(d) Incorporate The DT Data For New And Existing Repairs and Alterations into Operators Maintenance Program.

(e) Submit the implementation plan to the PMI for approval.

102 thru 199 RESERVED.

CHAPTER 2. REPAIRS - DESIGN APPROVAL HOLDERS TASKS

200. GENERAL INFORMATION ABOUT THIS CHAPTER.

This chapter provides guidance to design approval holders (DAHs) for developing data to support compliance with §§ 25.1823, 25.1825, 25.1827 and operator compliance with §121.1109 and § 129.109, with respect to repairs and repairs to alterations. This includes the development of damage tolerance procedures, DTE processes, and DT data. For repairs installed on structure that has been altered, the operator should coordinate with the party (TC, non TC, or STC Holder) responsible for the alteration to develop the required damage tolerance data.

201. DEVELOPMENT OF COMPLIANCE DOCUMENTS.

a. Design approval holders (DAH) supporting the operation of airplanes under 14 CFR 121 and 129 should use the following guidance material to develop Compliance Documents which contain information and data that the operator will need to demonstrate compliance. Airplanes certified to Amendment 25-54, or later, may not need additional DT data to be developed but will require the development of a Compliance Document. This will allow an operator the means to demonstrate to his PMI how his existing maintenance program meets the intent of the AASFR relative to new and existing repairs.

b. To facilitate compliance with the AASFR with respect to repairs, compliance documentation should be created that encompasses all fatigue critical structure, including repairs, to repairs and alterations as necessary. The compliance document will be applicable to a specific airplane model or airplane serial number(s). The documentation should provide the data necessary for developing an Operator Implementation Plan with respect to a given airplane. The Compliance Document should also include implementation schedule information as well as specific guidance on which repairs will require evaluation. The process for evaluation of repairs contained in this AC considers both existing and future repairs. Existing repairs will be brought into the program using the implementation plan and airplane surveys after December 20, 2010 (See Appendix 6). New repairs, installed after December 20, 2010 will be required to have DT data provided within the guidelines contained in Appendix 5.

c. To assist the operators in establishing DT data for various repairs the establishment of a Repair Evaluation Guidelines (REG) is proposed. These guidelines will provide instructions to the operator on how to survey airplanes, how to obtain DT data and an implementation schedule that would provide timing for airplane surveys and when the DT data is needed. Concerning the processes used to obtain DT data, the process most commonly used today by operators to obtain DT data is time consuming and resource intensive. The REG would provide operators with various methods for obtaining DT data for repairs. Possible methods for obtaining the required DT data should include:

- *Using existing FAA approved data.* These should include TC holder developed service information such as SRMs, service bulletins, and Repair Assessment Guideline (RAG) documents developed for compliance to § 121.1107.

- *Making direct requests for support from the TC holder for repairs.* If the TC holder determines that the existing service information does not provide operators with the needed DT data, the process may recommend that the operator directly solicit DT data from a TC holder. In this case, the TC holder would evaluate the operator's request and make available damage tolerance inspections for a specific repair or alteration or group of repairs and alterations as needed. If the processes developed for the repair evaluation guidelines direct the operator to obtain assistance from the TC holder, the TC holder would be required to provide such assistance. This assistance must be provided in a manner that would support the DT data implementation schedule.

- *Using repair evaluation procedures.* These procedures would enable operators to establish damage tolerance inspections without having to contact the TC holder for direct support. These procedures may be similar in concept to the RAG documents. If technically feasible, a new generalized RAG may be developed to support operators with a streamline process to develop DT data for certain repairs. The REG would incorporate any new RAG.

d. Where specific DT data needs to be developed to support compliance with the AASFR, it is recommended that the model-specific Compliance Document be produced as a joint effort between the DAH, operators, and airworthiness authorities. In previous aging aircraft programs, ARAC's AAWG formed airplane model specific Structures Task Groups (STGs) to develop programs for those models. Where necessary, an STG for this activity should be formed and tasked to develop the model-specific Compliance Document.

e. Figure 1, below, shows the process that should be used to produce a Compliance Document that supports compliance with the AASFR for repairs to fatigue critical structure. The paragraphs referenced in Figure 1 are in Chapter 2 of this AC.

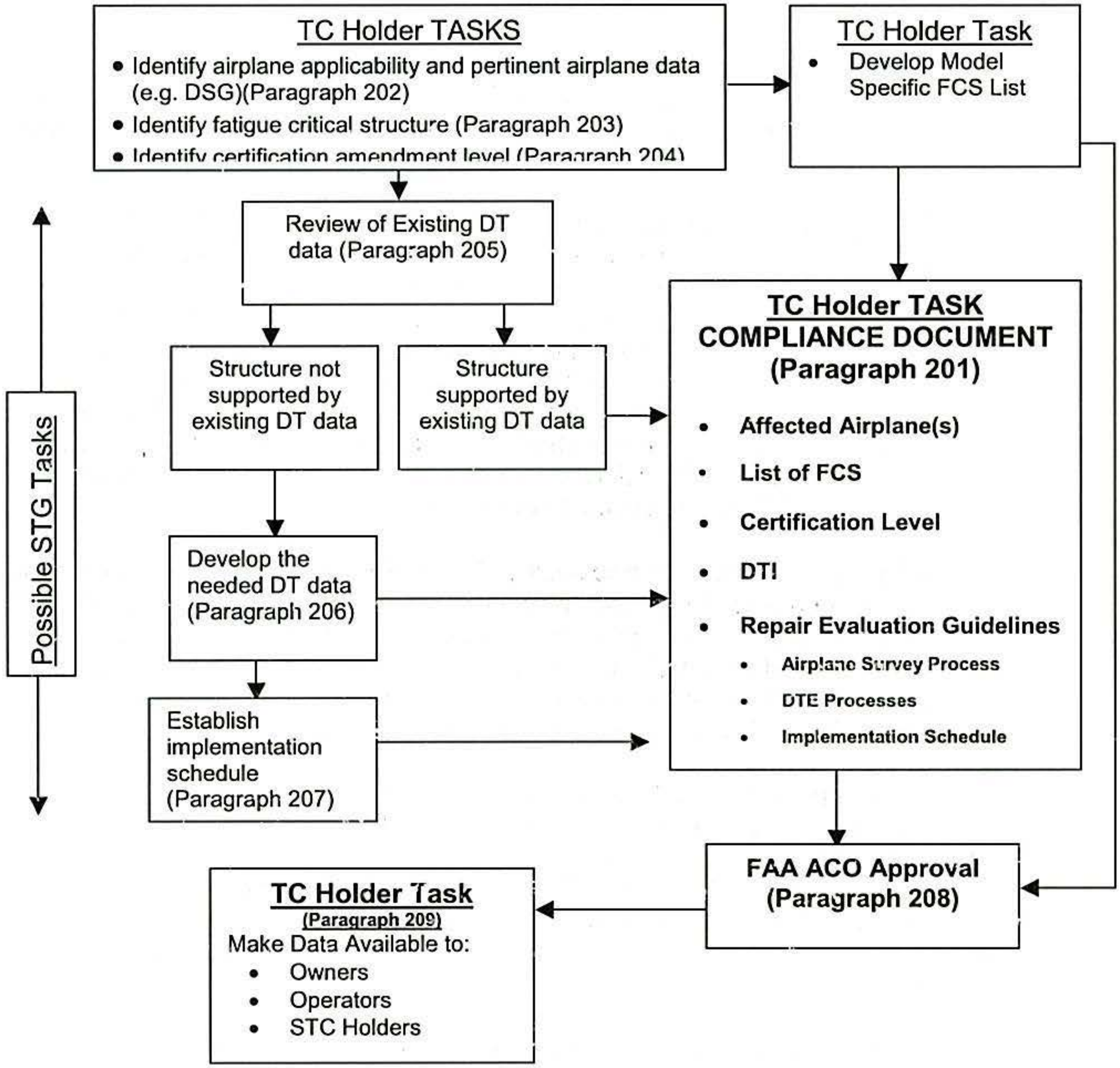


Figure 1. Development of a Compliance Document.

202. IDENTIFICATION OF AFFECTED AIRPLANES.

The airplane model and model variations or serial numbers, including gross weights, should be identified in the Compliance Document for the applicable airplane models. For each model of airplane, the DAH will identify the DT data needed to support compliance with the AASFR

203. IDENTIFICATION OF FATIGUE CRITICAL STRUCTURE.

a. Paragraph (c) of § 25.1823 requires TC holders to identify and make available a list of structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. This structure is referred to as "fatigue critical structure". Guidance for identifying this structure can be found in AC 25.571-1C, "Damage Tolerance and Fatigue Evaluation of Structure," dated April 29, 1998, or latest version. When fatigue critical structure is repaired it requires DTE to comply with the AASFR. This includes repairs to alterations of fatigue critical structure. A fatigue critical structure list will be included as part of the Compliance Document.

b. When identifying fatigue critical structure, it is not sufficient to consider only that structure contained in the SSID or ALS. Some SSIDs or ALSs might only include supplemental inspections of critical elements of the fatigue critical structure, as determined by the damage tolerance analysis. Other areas of structure may require supplemental inspections if repaired.

c. The STC Holder, based on the information available from the TC holder, should identify how his alteration affects the baseline FCS and provide that information in a separate document. Further the STC Holder should identify the extent to which his alteration affects the baseline FCS where repairs installed in this affected area will require him to develop DT data for those repairs.

d. For compliance with § 25.1823(c), TC holders must develop a list of fatigue critical baseline structure, and submit it to the FAA Oversight Office for review and approval no later than 90 days after the effective date of the rule. Upon approval, the TC holders must make the list available to persons required to comply with § 25.1827 (STC holders) and §§ 121.1109 and 129.109 of the AASFR (operators). This list should also be included in the compliance document.

204. CERTIFICATION AMENDMENT LEVEL.

In order to understand what data is required for compliance with the AASFR, the TC holder should identify the amendment level of the original certification relative to 14 CFR Part 25.571. The amendment level is useful in identifying what DT data may be applicable and what standard should be used for developing of DT data for AASFR compliance. The two airplane groups that are relevant to the AASFR are:

a. Group A - Airplanes certified before 14 CFR 25.571 Amendment 25-45, damage tolerance requirements. These airplanes were not evaluated for damage tolerance as part of the original type certification. Therefore, the requirements of the AASFR are beyond the scope of the original certification amendment level. Repairs to fatigue critical structure will need development of DT data unless previously accomplished.

b. Group B - Airplanes certified to 14 CFR 25.571 Amendment 25-45 or beyond. Repairs to these aircraft will need to meet their certification level. Although these airplanes were evaluated for damage tolerance, they may not have repair data that includes DT data. In this situation, the DAH and operators may need to identify and perform a DTE of these repairs and develop DTI or other procedures.

205. REVIEW OF EXISTING DT DATA.

a. Introduction. The DAH, in support of his product, publishes a number of different documents that may provide the necessary DT data for AASFR compliance. Each of these documents will need to be reviewed to determine if that data exists. These documents typically include:

- **(1)** Repair Assessment Guidelines (RAG)
- **(2)** Structural Repair Manual
- **(3)** Individual Repairs
  - **(a)** To areas covered by ALS, SSIP and RAP
  - **(b)** Other individual repairs
- **(4)** Service Bulletins that provide
  - **(a)** Inspections for RAMs
  - **(b)** Significant modification or
  - **(c)** Repair service bulletins
- **(5)** Airworthiness Directives (ADs) that mandate
  - **(a)** Modifications or repairs
  - **(b)** Inspections to STCs

Review each of the items above to determine the applicability of the data for compliance with the AASFR.

Repairs With Existing DT Data. Repairs, including those in Service Bulletins, published in existing TC holder documents that have FAA approved DT data form a portion of the data required for compliance with the AASFR. These repairs should be documented in the Compliance Document. In addition, the following model specific documents may contain additional data that supports compliance to the AASFR:

(1) Repair Assessment Guidelines (RAGs). The programs developed for complying with §§ 121.1107 and 129.107 (previously designated as §121.370 and 129.32) resulted in model specific RAGs. These documents provide support in complying with the AASFR for repairs to the fuselage pressure boundary. Additionally, under certain circumstances, the RAG documents developed may be applicable to repairs to STC's that are embodied on the fuselage pressure boundary.

(2) Service Bulletins (SBs) and Airworthiness Directives (ADs). Review Service Bulletins and ADs that provide instructions to inspect, or repair fatigue critical structure. Determine if it supports compliance with the AASFR. The DAH should propose a process for reviewing these documents.

(3) Structural Repair Manuals (SRMs). The Structural Repair Manual may contain some of the information required for compliance with the AASFR and other existing programs, such as the SSIP and RAP. Review SRMs to identify all repairs to fatigue critical structure and if those repairs have had established DT data.

206. DEVELOPMENT OF ADDITIONAL DT DATA TO SUPPORT COMPLIANCE.

a. Introduction. Damage tolerance inspections and procedures means establishing the following maintenance requirements for repairs:

(1) A threshold for when to commence inspections of the structure.

(2) A repetitive interval for repeat inspections

(3) A method of inspection.

(4) Occasionally, a life limit for replacing structure.

b. Repair Categories and Associated Maintenance Requirements.

(1) For repairs, the following repair category terminology from AC 120-73 is used to assist in describing the maintenance requirements.

(a) <u>*Category A*</u>: A permanent repair for which the BZI is adequate to ensure continued airworthiness (inspectability). The operator's approved maintenance or inspection program must be at least as rigorous as the BZI.

(b) Category B: A permanent repair that requires supplemental inspections to ensure continued airworthiness.

(c) Category C: A temporary (time-limited) repair that will need to be reworked or replaced prior to an established time limit. Supplemental inspections may be necessary to ensure continued airworthiness prior to this limit.

(2) For each of the identified repair categories, the following maintenance requirements would be needed.

(a) For Category A repairs, normal maintenance procedures (inspection threshold and /or BZI) are sufficient to provide the required damage tolerance coverage.

(b) For Category B repairs, items 1, 2, and 3 above are normally provided as part of the damage tolerance package.

(c) For Category C repairs, all four items are provided as necessary.

c. Analysis Standards and Repairs to be Evaluated

(1) Development of DT data, requires the use damage tolerance requirements dependant on the certification level of the affected airplane. For Group A airplanes use the requirements of 14 CFR 25.571 at Amendment 45 as a minimum standard. For Group B airplanes use the requirements that correspond to their original certification level as a minimum standard.

(2) For each of the following, the TC holder, or the DAH (for an alteration) should develop DT data according to the minimum standard determined in (1) above:

(a) SRM Repairs.

(b) SB Repairs.

(c) AD Mandated Repairs.

(d) TC holder reviewed and approved repairs that have general interest (multiple airplane approvals).

(e) Other repairs, including third-party approved repairs, repairs to alterations or alteration affected structure and repairs that deviate from published repairs that otherwise qualify as damage tolerant.

(3) For future repairs, damage tolerance evaluation on an individual repair basis is acceptable. However, it may be more efficient to use published repair instructions such as SRMs or RAGs that contain already approved DT data. For published repair data to be acceptable, it must be FAA Approved and it should contain a statement that

DTE has been accomplished, and the data should include any DTI resulting from the DTE.

(4) For existing repairs that are identified during an individual airplane survey, there are at least two possible approaches to evaluate a repair. The first would involve a damage tolerance analysis on individual repairs as those repairs are identified. This will be necessary for unique and complex non-routine repairs. Another approach would be to develop guidelines to assess repairs that are not addressed by existing RAGs developed for compliance with 14 CFR 121.1107. The development of these additional guidelines is complex and therefore requires the support of the TC holder.

d. Performing DTEs and developing DTI on a case-by-case basis. If performing DTEs and developing DTI on a case-by-case basis, use the guidance included in AC 25.571 consistent with the certification amendment level identified in Chapter 2, paragraph 204 of this AC.

e. Development of additional repair assessment guidance. The update of the SRM, SBs, together with the existing RAG documents, forms the core of the information supplied to the operator for compliance with the AASFR. A means will be developed and documented in the compliance document to assist the operator in evaluating repairs using the updated published standards and to determine if additional DAH support is necessary. This support may be in the form of individual repair DTA data requests or new repair evaluation guidelines (e.g. may cover fatigue critical structure of the wing, fuselage, empennage, etc.). The means developed should provide operators with a high degree of confidence that they can comply with the requirements of the AASFR.

In the development of new evaluation guidelines, the percentage of existing repairs that could be addressed by the new repair guidance material should weighed against the resources and time required to develop and have the guidance approved. General guidance on development of this material can be found in AC 120-73, "Damage Tolerance Assessment of Repairs to Pressurized Fuselages," December 14, 2000. Even though this guidance is for the Fuselage Pressure Boundary, it can also be used for structure that is susceptible to fatigue cracking.

f. SRMs. Based on the review described in paragraph 205 of the AC, determine if the SRM needs revising to support compliance with the § 25.1823(d). In determining the extent by which an SRM may need to be revised for compliance with § 25.1823(d), consider the following:

(1) Whether the existing SRM contains an adequate description of damage tolerance data for the specific model. This includes defined repair categories.

(2) Whether normal maintenance procedures (e.g. the inspection threshold and/or baseline zonal inspection program) cover Category A repairs.

(3) Whether the SRM contains an identification of fatigue critical structure for the model specific airplane that, if repaired, will need a damage tolerance assessment.

(4) Whether SRM Chapter 51 standard repairs have a DT evaluation.

(5) Whether all SRM specific repairs for fatigue critical structure have DT Data.

(6) Whether there is specific guidance on the size of repairs that would qualify as Category A repairs.

(7) Whether there is any guidance on proximity of repairs and the effect of this condition on damage tolerance characteristics.

(8) Whether superseded repairs are addressed and how DT data for future superseded repairs will be made available.

g. Service Bulletins. Based on the review performed in paragraph 205 of this AC, determine if the SBs need DT data to support compliance with the AASFR. Compliance Document needs to identify the status of the DT data for those service bulletins. A Service Bulletin review process is provided in Appendix 9 to assist the TC holder in determining which SBs require review.

207. IMPLEMENTATION SCHEDULE.

The implementation schedule described in this Paragraph represents an acceptable time line to establish DT data and continued airworthiness maintenance plans for both existing and new repairs. Justify any deviation to the time line and present it to the FAA oversight office for approval. Include the information contained in this chapter in the Compliance Document to support the operator in developing an implementation plan for his particular fleet of airplanes. This Implementation Schedule will support compliance to 14 CFR 121.1109 (1) with respect to the requirement to address the adverse effects repairs have on fatigue cracking and the inspection of fatigue critical structure. In principle this implementation schedule is similar to the implementation schedule adopted for compliance to 14 CFR 121.1107.

a. Existing repairs that already have DT data developed and in place in the maintenance program. These repairs require no further action.

b. Existing repairs that either require developing DT data or have not had ICA embodied in the maintenance program. Identify and evaluate all existing repairs to fatigue critical structure. For the purposes of compliance to the AASFR, only existing repairs that reinforce (e.g. restore strength) the fatigue critical structure need to be considered; this typically excludes maintenance actions such as blend-outs, plug rivets, trim-outs, etc. For those existing repairs that do not have DT data or other procedures implemented, establish that data according to an FAA approved plan. Assessing existing repairs consists of:

- Airplane Repair Survey.

- Identification and Disposition of repairs requiring immediate action.
- DTI Development.

Appendix 5 defines these three steps. The timing allowance for each of these steps for any given airplane depends on the age of the airplane on December 18, 2009. The following program will support the DAH development of an Implementation Schedule for the Compliance Document. This implementation schedule would be incorporated as part of the Operator's Implementation Plan developed in Chapter 3 of this AC.

(1) Implementation Schedule for Survey and Disposition.

(a) Airplanes less than 75% DSG on December 18, 2009. Operators would complete a survey at the first D-check after 75% DSG, not to exceed DSG, completing steps 1 and 2 of the DTI assessment process (see Appendix 5). After accomplishing step 1, complete step 3 of Appendix 5 within 12 months.

(b) Airplanes between 75% DSG and DSG on December 18, 2009. Operators would complete a survey of these airplanes completing steps 1 and 2 of the DTI assessment process (see Appendix 5) at or before the next major check (equivalent to a D-check) after December 20, 2010, not to exceed DSG or 6 years whichever is greater. After accomplishing step 1, complete step 3 of Appendix 5 within 12 months.

(c) Airplanes greater than the DSG on December 18, 2009. Operators would complete a survey of these airplanes completing steps 1 and 2 of the DTI assessment process (see Appendix 5) at or before the time limit equivalent to a D-check after December 20, 2010, not to exceed 6 years. Operators should not defer the implementation of the program until the end of the D-check time period. For example, if an operator had 30 airplanes over DSG on December 18, 2009 and was operating on a six year D-check equivalent, the operator would inspect approximately 5 equivalent airplanes each year until all of the airplanes were inducted into the program. Within 12 months after accomplishing Step 1, complete step 3 of Appendix 5.

NOTE: The DAH will identify the established DSG for a particular airplane type that is representative of the airplane considering the probable variation of the number of flight hours per cycle that could exist in the fleet.

(2) Implementation of DTI.

(a) Once the DTI is known, accomplish the first inspection of the repair according to the schedule of the DTI as follows:

i Inspect the repair before the inspection threshold or within a time limit equivalent to a C-check from accomplishment of the assessment, whichever occurs later.

ii If the age of the repair is unknown, use the aircraft age in cycles or hours.

(b) Implement repeat inspection intervals per the instructions provided.

d. New Repairs. Unless already required by the airplane certification level or other FAA approved program, all new repairs to fatigue critical structure installed beginning December 21, 2010, and thereafter must have DTE performed. Implement DTI according to the process described in Appendix 5, "Approval Process for New Repairs". This includes blendouts, trim-outs, etc. that are beyond published DAH limits.

e. Repairs to Removable Structural Components. Fatigue critical structure may include structure on removable structural parts or assemblies that can be exchanged from one aircraft to another such as door assemblies, flight control surfaces, etc. In principle, the DT data development and implementation process also applies to repairs to fatigue critical structure on components. During their life history, however, these parts may not have had their flight times recorded on an individual component level because of removal and reinstallation on different airplanes multiple times. These actions may make it impossible to determine the age or total hours/cycles. In these situations, guidance for handling DT data development and implementation for existing and new repairs is given in Appendix 6.

208. FAA ACO APPROVAL OF COMPLIANCE DOCUMENT.

The FAA oversight office for the affected airplane or STC will approve the Compliance Document and any revision to an FAA-approved Compliance Document.

209. TCH DOCUMENT AVAILABILITY

The TCH will make available such documents as specified in 14 CFR 25.1823 to owners, operators and STC Holders.

211 THRU 299 RESERVED.

CHAPTER 3. ALTERATIONS – DESIGN APPROVAL HOLDER TASKS

300. GENERAL INFORMATION ABOUT THIS CHAPTER.

This chapter gives guidance to design approval holders for developing data to support operator compliance with § 121.1109 and 129.109.

301. ESTABLISHING A MEANS OF COMPLIANCE FOR ALTERATIONS

a. To facilitate compliance with the AASFR with respect to alterations, a means of compliance should be developed to address alterations that affect fatigue critical structure. The means of compliance will be applicable to a specific alteration and should provide the data necessary for developing, in part, an Operator Implementation Plan with respect to the fleet of airplanes operated by a particular operator.

b. The operator would need to show that the required maintenance actions are included in his operational specification. This will be done by the preparation of an Operator Implementation Plan (OIP) (See Chapter 4). The OIP will contain data developed from the activities required to support compliance with 14 CFR 25.1823, 25.1825 and 25.1827 which will provide a comprehensive plan to accomplish the required maintenance actions. For each affected alteration the DAH should provide the following:

1. DT data established as part of the original certification of the alteration, if it exists.
2. Data that would show that the alteration itself did not create fatigue critical details.
3. DT data for the fatigue critical details of the alteration if it did not already exist.
4. DT data for the baseline fatigue critical structure affected by the alteration, if any.
5. DT data for the fatigue critical structure of the alteration itself, if any.
6. An implementation schedule for fatigue related inspections, if any.
7. A means of compliance approved by the cognizant ACO:
    - i. A change to the original alteration approval documentation that details all of the necessary maintenance actions.
    - ii. A Service Bulletin that details all of the necessary maintenance actions.
    - iii. A Compliance Document
    - iv. A Letter from the DAH that demonstrates compliance.

c. Where specific DT data needs to be developed to support compliance to the AASFR, it is recommended that the Compliance Document be produced as a joint effort between the DAH and operators.

d. Figure 2 shows the process that may be used to determine a specific means of compliance that supports and operator's compliance with the AASFR for alterations to fatigue critical structure:

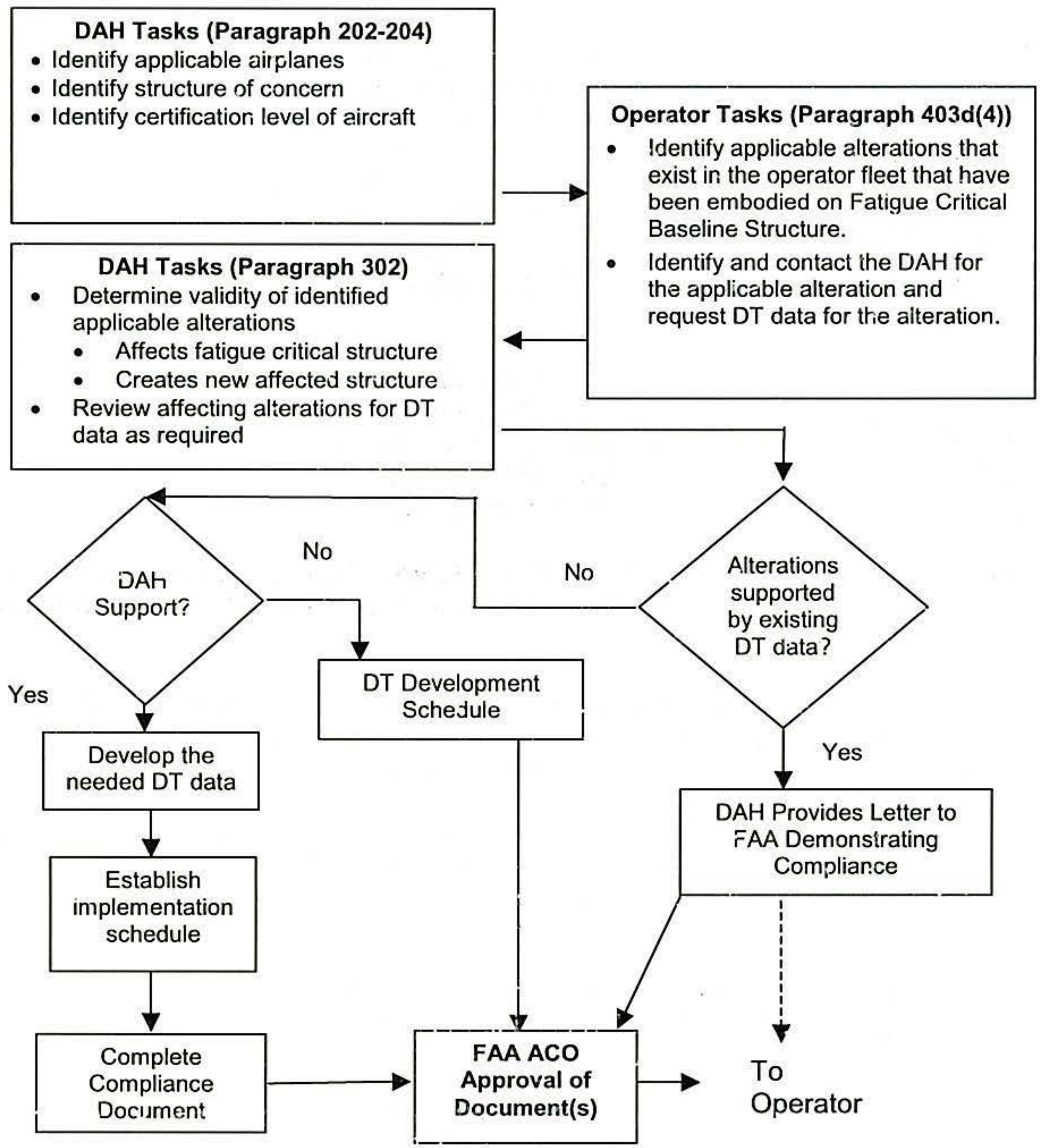


Figure 2 – Development of a Means of Compliance for Alterations

302. DAH Tasks

a. Identification Of Affected Airplanes And Fatigue Critical Structure. The TC Holder will develop model specific data detailing the structure that is fatigue critical and the 14 CFR 25.571 Amendment level that should be used to develop the DT Data (Paragraphs 203 and 204). This data will be presented to the FAA as required under 14 CFR 25.1823. The list of FCS will be made available to the operators. The DAH will need this data to perform his task. The DAH may obtain the data directly from the TC Holder, the operators or develop his own data. If the DAH develops his own data that data should be submitted it to the FAA Oversight Office for approval. This is the first step in the process.

b. Certification Amendment Level. The certification amendment level to be used for determining DT data for a specific existing alteration should be the same certification level established for the assessment of repairs and repairs to alterations. For certification of new alterations, the Changed Product Rule (14 CFR 21.101) may require the latest 14 CFR 25.571 amendment level to be used.

c. Identification of Alterations To Be Considered. There are three categories of alterations that may be installed on a transport category airplane. All three of which may require the development of DT data:

1) **Supplemental Type Certificates (STCs)** – STCs are normally developed by persons other than the Type Certificate Holder (TC Holder). They are approved by the FAA under Subpart E of 14 CFR 21.

2) **TC Holder alterations** – these are alterations that are developed and approved by the TC Holder, either through an Amended Type Certificate approved by the FAA under Subpart I of 14 CFR 21, or through FAA-approved service documents such as Service Bulletins

3) **Individual alterations** – these are alterations that are developed by and for an operator and are approved through individual FAA Forms 337 or other means acceptable to the Administrator.

d Specific Alterations To Be Considered. The DAH should consider alterations he owns that fall into anyone of the categories Listed in Appendix 11:

e. Determination of alterations that need DT Data. Using the guidance provided in AC 25.571-1x and the detailed knowledge of the alteration and it's effect on the baseline structure, the DAH should consider the following situations in determining what DT Data needs to be developed for compliance to the AASFR:

1) **Alterations that affect fatigue critical structure.** Any alteration defined in d above that is installed on baseline fatigue critical structure must be evaluated regardless of the size or complexity of the alteration. In addition, any alteration which indirectly affects baseline fatigue critical structure (for example, alterations which change the fatigue loads environment affect the inspectability of the structure, etc.) must also be evaluated.

2) **Alterations that create new fatigue critical structure.** Any alteration that creates new fatigue critical structure (as defined in AC 25.571-1x) must be evaluated regardless of the size or complexity of the alteration. Examples of this type of alteration may be an alteration that adds new structural splices, or which increases the operational loads causing existing structure to become fatigue critical.

3) **Repairs to Alterations or repairs to FCS affected by the alteration.** Repairs incorporated on an alteration determined to either affect FCS or create FCS should be analyzed to determine if DT data is required.

f. Review Affecting Alterations For Existing DT Data. Based on the 14 CFR 25.571 certification amendment level and other existing rules, the alteration's approval documentation may provide DT data to support compliance with the AASFR.

The DAH will identify alterations that have existing FAA Approved DT data that will support compliance with the AASFR. Acceptable DT data would contain a statement of DTE accomplishment and be FAA approved. Existing FAA Approved DT data should be made available to the operators by suitable means (e.g. STC Amendment etc).

Alterations that have been developed by a TC Holder may affect fatigue critical structure. These include Amended Type Certificates (ATCs) and in some cases Supplemental Type Certificates. These changes to type design also require a review for data needed for compliance to the AASFR.

g. Development Of Additional DT Data To Support Compliance. The DAH for the alteration is responsible for the development of the required DT data to support compliance with the AASFR.

There are four possible scenarios:

a. **The DAH no longer exists.** In some cases, the STC may have been surrendered to the FAA, or;
b. **The DAH exists but is unable or unwilling to develop the DT data.** The DAH may not have the resources available to develop the data, or may be unwilling to commit the resources to do so, or;
c. **The DAH exists and will provide the DT data, or;**
d. **The DT data already exists and is available.**

The DAH would use the guidance in AC 25.571-1x consistent with the certification amendment level of the affected airplane to identify which areas of the alteration require assessment as fatigue critical structure. The minimum certification amendment level for a specific alteration is identified in Paragraph 204.

With reference to the three categories of alterations described in Paragraph 302c, the DT data may be published as follows:

1) **Supplemental Type Certificates (STCs)** – The additional DT data for existing alterations may be published in the form of an amended STC, a supplemental compliance document, or an individual approval.
2) **TC Holder alterations** – The additional DT data for existing alterations may be published in the form of an amended TC, TC Holder Service Information, etc.
3) **Individual alterations** – Unless previously accomplished, the operator shall obtain DT data for existing individual alterations to fatigue critical structure. For those existing individual alterations that do not have DT data or other procedures implemented, establish the DT data according to an FAA approved plan (See Paragraph 304). One means of compliance may be to publish a revision to the individual alteration that contains the DT data.

303. Implementation Schedule.

The implementation schedule contained in this paragraph represents an acceptable time line to establish DT data and continued airworthiness maintenance plans for both existing and new alterations. Any deviation to the time line must be justified and presented it to the FAA Oversight Office for approval. The information contained in this chapter should be included in the OIP for their particular fleet of airplanes.
a. Acceptable Compliance Timeline for STCs, TC Holder Alterations, and Individual Alterations

1) **Existing alterations installed prior to December 20, 2010.**

   i. **The DAH is supporting the AASFR Requirements**

   The DAH will provide DT data for their alteration by December 18, 2009.

   Operators will have until December 20, 2010 to incorporate that DT data into their maintenance program.

   ii. **The DAH has not developed the DT data, and they will not or cannot develop the data by December 18, 2009.**

   The operator shall provide a DT development schedule to obtain DT data and incorporate this into the implementation plan no later than December 20, 2010. The DT data should be available no later than December 20, 2012, or prior to the airplane reaching 75% DSG, whichever occurs later. The operator will incorporate the DT data into their maintenance program no later than 12 months from FAA approval of the data.

iii. The alteration identified during airplane survey.

For those alterations that were not identified via a records review in paragraph i. or ii. above, they may be found during the survey for repairs. In this case the operator has 24 months from time of discovery to obtain the DT data and incorporate the data into their maintenance program.

For Subparagraphs (ii) and (iii), once the DT data is developed for the alteration on the first airplane, the data may be applicable to another airplane in their fleet with the same alteration.

2) Any alteration installed after December 20, 2010 that affects or creates FCS, must have DT data to comply with AASFR.

3) Implementation of DTI.

Accomplish the first inspection of the alteration according to the schedule of the DTI as follows:

i. For airplanes which have not reached the implementation threshold for the DTI, accomplish the first inspection of the alteration before the inspection threshold or within a time limit equivalent to a BZI C-check interval from incorporation of the DTI into the operator's approved maintenance program, whichever occurs later.

ii. For airplanes which are beyond the implementation threshold for the DTI, accomplish the first inspection within a time limit equivalent to a BZI C-check interval from accomplishment of the assessment.

iii. If the age of the alteration is unknown, use the aircraft age in cycles or hours as applicable.

iv. Implement repeat inspection intervals per the instructions provided.

304. DAH Compliance Documentation.

For those alterations where the DAH is supporting their alteration, this Paragraph provides guidance for how to provide compliance documentation for that alteration to support operator compliance to the AASFR.

If the DAH already has FAA-approved DT data for the required 14 CFR Part 25.571 Amendment Level, the DAH should submit a letter to the FAA Oversight Office that details the status of the Alteration with respect to damage tolerance. In addition, if the DAH makes the determination that the standard maintenance program defined by the BZI is sufficient for the continued airworthiness of the alteration, he should submit such a finding on FAA Form 8110-3, or equivalent, to the FAA Oversight Office.

If DT data has to be developed to support compliance to the AASFR, a Compliance Document must be developed and submitted to the FAA Oversight Office for approval. The Compliance Document should contain the following information:

a. A description of the alteration (define contents, e.g. gross weight limits);
b. The applicable airplane(s) and the affected fatigue critical structure (Paragraphs 202 and 203 of this AC);
c. The 14 CFR 25.571 certification level used for determining the DT data (Paragraph 204 of this AC);
d. The DT data for the alteration (Paragraph 302g of this AC);
e. An implementation schedule for incorporating the DT data (Paragraph 303 of this AC)

For an alteration where specific DT data needs to be developed to support compliance to the AASFR, it is recommended that the compliance documentation be produced as a joint effort between the DAH and operators where possible.

305. DT DEVELOPMENT SCHEDULE WHERE DAH DOES NOT SUPPORT THE OPERATOR

For those alterations where the DAH does not support their alteration, this Paragraph provides guidance for an operator to produce a DT Development Schedule for that alteration to support compliance to the AASFR. The DT Development Schedule should contain the following information:

a. A description of the alteration;
b. The applicable airplane(s) and the affected fatigue critical structure (Paragraphs 202 and 203 of this AC);
c. The 14 CFR 25.571 certification level to be used for determining the DT data (Paragraph 204 of this AC);
d. The plan to obtain the DT data for the alteration (Paragraph 302g of this AC)
e. The schedule to incorporate the DT data once it is received (Paragraph 304 of this AC)

306. FAA OVERSIGHT OFFICE APPROVAL.

For the DAH Compliance Document, the FAA oversight office for the alteration will approve the Compliance Document and any revision to an FAA-approved Compliance Document.

For the DT Development Schedule, the FAA Oversight Office for the alteration will approve the Development Schedule. After the DT Development Schedule is approved, the operator will obtain the necessary DT data via an FAA Form 8110-3 or equivalent within the time period agreed upon.

307 THRU 399 RESERVED.

CHAPTER 4. OPERATORS IMPLEMENTATION PLAN - OPERATOR TASKS

400. GENERAL INFORMATION ABOUT THIS CHAPTER.

This Chapter will guide operators on the procedures to obtain damage tolerance inspections and procedures. This Chapter will additionally guide operators on how to revise their maintenance programs as required by 14 CFR 121.1109 and 129.109.

401. DEVELOPMENT OF AN OPERATORS IMPLEMENTATION PLAN (OIP)

The AASFR requires affected air carrier certificate holders to incorporate FAA-approved DTE Processes and DTI into their maintenance programs by December 20, 2010 for repairs and alterations to fatigue critical structure. This includes processes for both existing and new repairs, and alterations of fatigue critical structure. The means of incorporating DT data into a certificate holder's FAA-approved maintenance program is subject to approval by the certificate holder's Principal Maintenance Inspector (PMI) or other airworthiness inspector. The compliance documents developed using Chapters 2 and 3 of this AC provides the basic information required, including identification of the fatigue critical structure, DT data and implementation schedule information.

Operators should develop an OIP that integrates the processes, data and requirements from the Compliance Document(s) and/or DT Development Schedule(s) developed using the guidance in Chapters 2 and 3. The OIP will be submitted to the PMI or other airworthiness inspector for review and approval. PMI Approval of the OIP for the airplanes affected constitutes compliance to the AASFR rule.

402. REVIEW OF APPLICABLE COMPLIANCE DOCUMENTS.

a. For each affected airplane in an operator's fleet, the operator should review the FAA Oversight Office-approved Compliance Documents (discussed in Chapters 2 and 3) that are applicable. The Compliance Document will identify all fatigue critical structure, the DT data for the fatigue critical structure, and implementation schedule information for incorporating DT data into the operator's maintenance program.

b. In addition, the operator should review any additional FAA Oversight Office approved Compliance Documents associated with a given model aircraft, for repairs, repairs to repairs and alterations, third-party approved repairs and alterations installed on their airplanes. These may be applicable to the entire model fleet or to individual aircraft within a given fleet type. These Compliance Documents will also identify fatigue critical structure for that fleet type, the DT data for the fatigue critical structure, and implementation schedule information for incorporating DT data into the operator's maintenance program.

403. CONTENTS OF AN OPERATOR'S IMPLEMENTATION PLAN

a. Figure 3 outlines one possible means an operator can use to develop an Operator's Implementation Plan for airplanes in their fleet.

b. The operator should include the following in the OIP:

(1) A process to ensure that all new repairs and alterations to fatigue critical structure will have DT data and have DTI or other procedures implemented.

(2) A process to ensure that all existing repairs and alterations to fatigue critical structure are evaluated for damage tolerance and have DTI or other procedures implemented. This process would include:

(a) A review of operator processes to determine if DT data for repairs and alterations affecting fatigue critical structure have been developed and incorporated into the operator's maintenance program throughout the life of the airplane. If an operator is able to demonstrate to its PMI that these processes ensure that DT data is developed for all repairs and alterations affecting fatigue critical structure, then no further action is required for existing repairs and alterations. For repairs and alterations with existing DT-based Instructions for Continued Airworthiness, the Operator's Implementation Plan should provide a cross-reference showing where the DT data for that alteration exists within the operator's FAA-approved maintenance program.

(b) A process that an operator can use to identify or survey existing repairs and alterations that affect fatigue critical structure and determine DTI for those repairs and alterations. This process should include an implementation schedule that incorporates the DT data into the operator's maintenance program within the timeframe given in the Compliance Document.

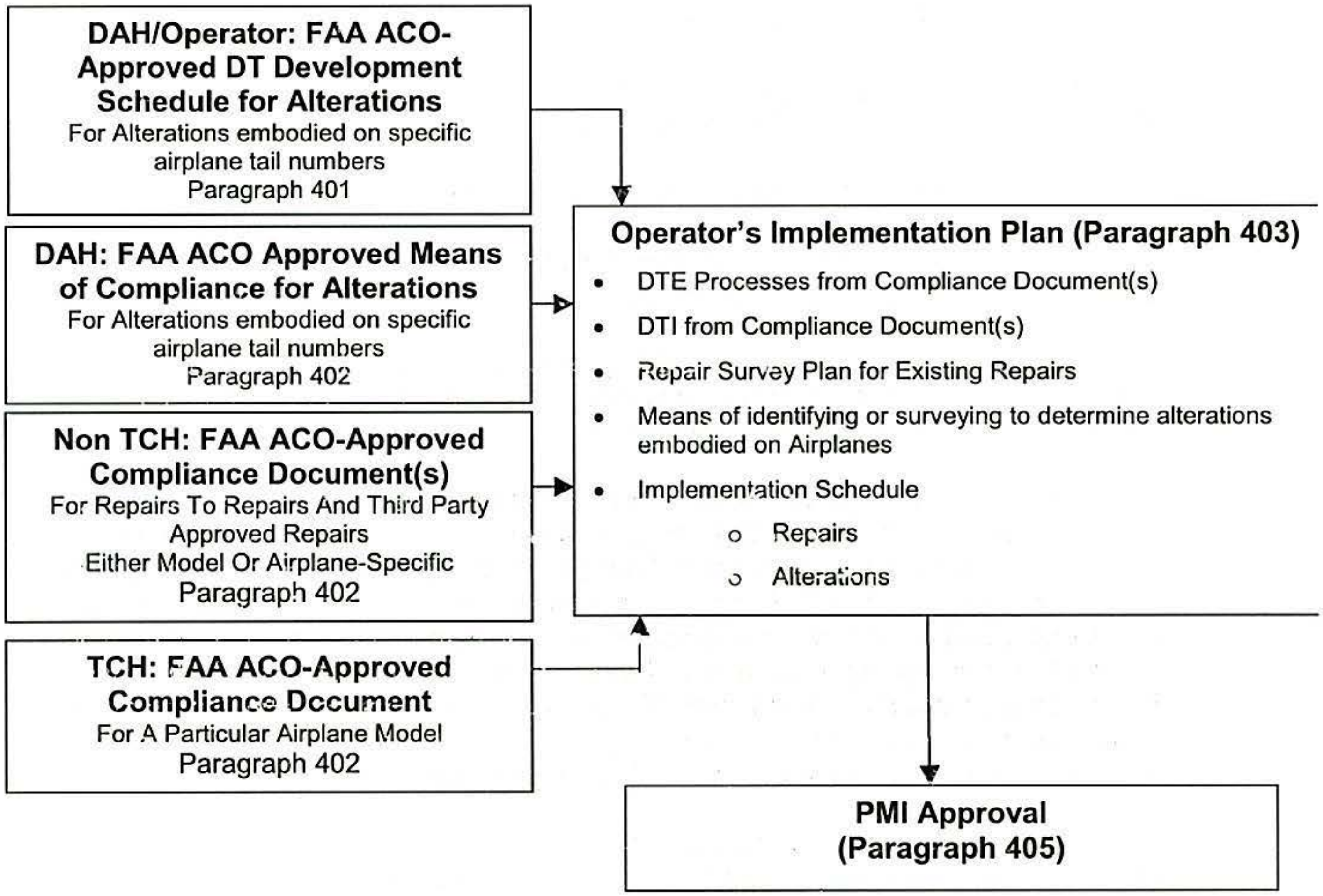


Figure 3. Operator's Implementation Plan Approval Process

c. Implementation Plan for Repairs.

(1) Repair Survey Plan. The OIP should contain a repair survey plan using the survey parameters from chapter 2 above to identify repairs that may need DT data developed. This survey plan may be divided into three groups of airplanes, those that are below 75% DSG, those that are between 75% DSG and DSG and those above DSG on December 18, 2009. (Note: In the following three-implementation plans, DSG is in cycles.) Examples of typical calculations to determine when an airplane would need to be surveyed are contained in Appendix 7.

(a) For an airplane that has not reached 75% DSG on Dec. 18, 2009. The operator must perform the survey at the first heavy maintenance check (equivalent to a D-check) after 75% DSG, not to exceed DSG. A heavy maintenance check (D-check or equivalent airplane inspection) means an airplane maintenance visit where all the major structural inspections are performed. In some cases this may be a formal D-check or, in the case of MSG-2 or -3 based maintenance program, the D-check equivalent may be the C-check multiple that contains the majority of the major structural inspections such as a "C-4" check which is sometimes called a Heavy Maintenance Visit (HMV).

(b) For an airplane that has reached 75% DSG but is less than or equal to DSG on Dec. 18, 2009. The operator should perform the survey at the next heavy maintenance check, not to exceed DSG or 6 years, whichever occurs later.

(c) For an airplane that has exceeded DSG on December 18, 2009, the survey should be accomplished at or before the next heavy maintenance check, not to exceed 6 years. The OIP should have a procedure in place to prorate airplane surveys in order to evenly spread out the surveys that need to be accomplished over a six-year time frame. Operators should not defer the implementation of the program until the end of the D-check time period. Rather they should evenly distribute the surveys over the 6-year period, with the high time airplanes being surveyed first. For example, if an operator has 30 airplanes over DSG on December 18, 2009, and is operating on a 6-year D-check equivalent, the operator would inspect approximately 5 equivalent airplanes each year until all of the airplanes were inducted into the program. The highest time airplanes should be inspected first (e.g., using the above example of 30 affected airplanes, the 10 highest time airplanes should be surveyed in the first two years.

d. Implementation Plan for Alterations:

(1) The OIP should contain a process to review records and produce a list of those alterations on their airplanes which affect fatigue critical structure. For each applicable alteration, the process should document the means of compliance for incorporating DT data associated with that alteration, whether through a DAH Compliance Document, an

maximum benefit. The initial and repeat inspections for the upgraded repair would then be accomplished at the intervals given for the repair against the component.

A repair could also be upgraded to one whose inspection requirements and methods are already fulfilled by an Operator's regular FAA-approved maintenance or inspection program (Section 403, Step e., Implementation Techniques, of this AC). That repair would then be repetitively inspected at each routine inspection interval applicable to the repair. Specific tracking would not be required because that area of the airplane would already be normally inspected on each airplane in the fleet as part of the existing approved maintenance program. If the Operator's program intervals were changed, the affect on requirements for specific tracking would have to be re-evaluated.

(2) Special Initial and/or Routine Inspections. As an option, existing repairs may have special initial inspections accomplished during the survey. This initial inspection would be used to establish an initial tracking point for the repair. Following this initial inspection, the DTI requirements (e.g., repetitive inspections) of the repair would be implemented.

In addition, special routine inspections could be defined for typical repairs that could be applied at a normal interval. In this case, an operator could check the affected components on each aircraft for this type of a repair at the defined interval. If the repair were found, the special inspection would be applied to ensure its airworthiness until the next scheduled check. This would alleviate the need to specifically track affected components for every repair, especially typical ones.

The development of inspection processes, methods, applicability and intervals would most likely require the assistance of the DAH for the fatigue critical structure in question. In all circumstances, the data must be approved by the FAA- Oversight Office.

APPENDIX 8. PROGRAM IMPLEMENTATION EXAMPLES

The following are provided to assist the operator in understanding how the program should be implemented. Two examples are given, one covers airplanes below 75% DSG on December 18, 2009, and the other is for airplanes beyond DSG on December 18, 2009.

a. Airplane Below 75% DSG on December 18, 2009

Consider the following:

(1) Airplane Total Cycles on December 18, 2009 – 55,000
(2) DSG = 75,000 Cycles, 75% DSG – 56,250 Cycles
(3) Time of last "D"-Check Equivalent – 53,000 Cycles
(4) 8 Year "D"- check Equivalent -- 360 Days/Year, 4 cycles/day = 11,680 Cycles

The survey would be performed after the airplane reaches 56,250 cycles and would be due before 64,680 cycles, but in any case would be required before the airplane reached 75,000 cycles.

b. Airplane Beyond DSG on December 18, 2009

Consider an airplane that has accumulated 80,000 cycles as of December 18, 2009, a DSG of 75,000 cycles. The airplane is currently on an 8 year "D" check equivalent and the last "D"-check was performed in January 2009 at 78,540 cycles. The survey would need to be performed prior to the airplane accumulating 90,220 cycles or 6 years whichever occurs sooner, based on the airplane utilization of 4 cycles/day, a 360-day year, and a maximum accumulated cycles of 81,460 as of December 20, 2010.

APPENDIX 9. SERVICE BULLETIN REVIEW PROCESS

Guidelines for the SB Flow Chart

This is primarily a TCH responsibility to screen SB to determine which ones require DT Data.

Please note: while it is believed that this guidance is fairly comprehensive, there is a reasonable possibility that not all situations have been considered. It is therefore incumbent on the user to use good judgment and rationale any determinations made.

The results of this process will be a list of service bulletins where special directed inspections are required to insure continued airworthiness. It will not contain a total list of all bulletins. Specifically it will not include those bulletins where the BZI program is sufficient to meet the damage tolerance requirements. A note similar to the follow will be prominently placed somewhere in the compliance document to attest to this unspoken requirement.

ALL SB HAVE BEEN EVALUATED FOR DAMAGE TOLERANCE INSPECTION REQUIREMENTS, SERVICE BULLETINS NOT INCLUDED IN THIS LIST HAVE BEEN DETERMINED TO SATISFY THE DAMAGE TOLERANCE REQUIREMENT BY INSPECTIONS COVERED IN THE BZI. THE BZI IS DOCUMENTED IN SECTION X.XXX.XX.X OF THE MPD.

Query 1 – Does the Service Bulletin address a structural repair or an alteration to fatigue critical structure? Historically any service bulletin, service letter or other device that lists ATA chapter 51 through 57 could provide repair or alteration instructions that may require DT data. In addition, certain repairs or alteration data carried out under other ATA chapters may affect fatigue critical structure. The first step in the process is to identify all such service instructions and develop a list of candidates for review (Q2).

Query 2 – Does the service instruction either specify a repair/alteration that creates or affects fatigue critical structure? If it does, then the Service instruction requires further review (Q3). If it does not, then the service instruction need no longer be considered.

Query 3 – Is the service instruction mandated? Service Bulletins and other service instructions that are under the requirements of an AD have a certain reporting and accountabilities built into them. As such, it is highly likely that the inspection programs have been established using either DT data and/or service based inspection results. They are also under continuous review for their adequacy and as such should be considered as complying with the requirements of the AASFR. Outcomes of this decision branch to two unrelated boxes (Q4 – if under AD) or (Q7- if not under AD).

Query 4 – Does the Service Bulletin or instruction contain terminating action? From Q3 we have already established that the inspection program for the baseline configuration is compliant with the AASFR requirements. This box asks if there is a terminating modification that terminates the AD mandated inspections. If no termination action exists, then the service bulletin is in compliance with the AASFR and no further action on the SB is required (note that repairs performed as a result of SB inspections are most likely done by reference to the SRM or via TELEX which will require review outside this process). If the SB does have a terminating action then further review is required (Q5).

Query 5 – Does the termination action have DT data? If the terminating action has a documented continuing airworthiness inspection program based on damage tolerance principals, then the SB is in compliance with the AASFR and should be documented on the list of Service Actions as such. If it does not, or the status of the inspection program cannot be verified, then further review is necessary (Q6).

Query 6 – Does the Service Bulletin address a safe-life part? If it does, other considerations exist that place this service action outside the scope of the AASFR. No further action is required. Otherwise, damage tolerant based inspections will need to be developed and provided to the operators. The Service bulletin should be referenced in the list along with where to find the required continued airworthiness inspection program.

Query 7 – From Q3 we have a structural service bulletin that has not been mandated by AD and this query asks if a one-time inspection is required to satisfy the intent of the requirement. If it does, it is deemed that this is being done to verify that a condition does not exist and, on condition, correct that condition to baseline configuration. As such normal SSID programs would then be expected to cover any required continued airworthiness inspections in compliance with the AASFR. If a repair is necessary, it is further assumed that this was done by reference to the SRM or other suitable means. No further action is required if this is the case and if a repair was necessary other means exist to determined the required DT data. If no inspections or multiple inspections are required, additional evaluation is required (Q8).

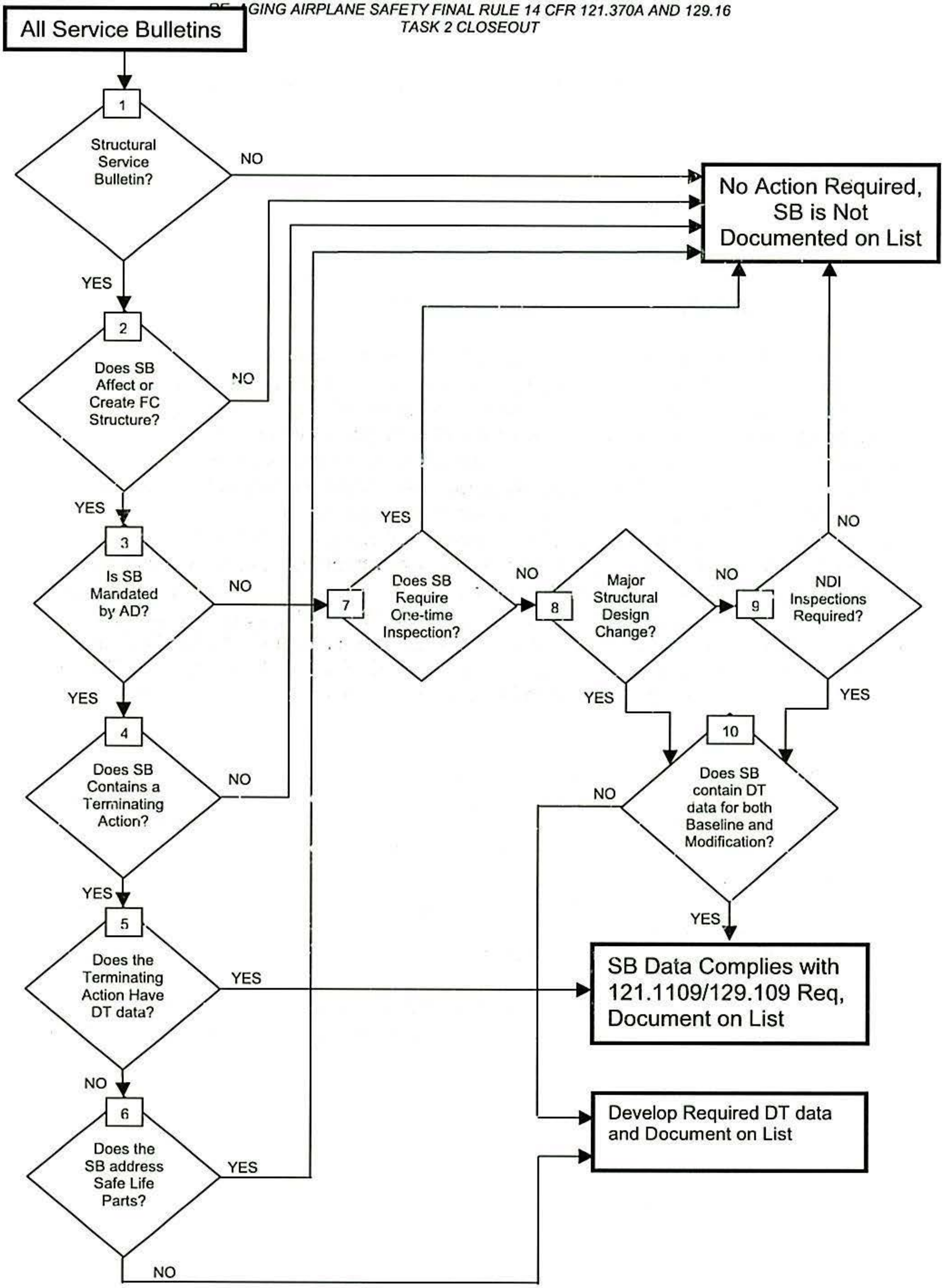
Query 8 – Is this a major structural design change (e.g. Alteration)? This is an OEM decision that is part of the original certification process and is not a major/minor repair decision. If it is not a major design change then proceed to Q10, if not, proceed to Q9.

Query 9 – Does the change require NDI inspections to verify the integrity of the structure or is normal routine maintenance inspections (as delineated in the BZI) sufficient? This is a subjective question and may require a re-evaluation of the change and where specific fatigue cracking might be expected. If normal maintenance inspections are adequate, no further action is required. Otherwise proceed to Q10.

Query 10 – Does the SB contain DT data for both the Baseline and Modified configurations? If so, the SB is in compliance with the AASFR and should be documented as such on the list. Otherwise, damage tolerant based inspections will need to be developed and provided to the operators. The Service bulletin should be referenced in the list along with where to find the required continued airworthiness inspection program.

Service Bulletin Screening Procedure

1. The screening will be performed by the DAH and the outcome validated by the STG.
2. A list of all service bulletins requiring action will be included in the Compliance Plan. Those not requiring action will not be in the list.
3. FAA Oversight Office approval of the compliance plan will constitute FAA concurrence with what has been screened out and therefore Flight Standards does not need to address service bulletins that have been incorporated on an airplane but do not appear in the Compliance Plan.
4. Service Bulletins included on the list will fall into one of two general types:
   Type I - Service Bulletins for which DT data exists.
   Type II - Service Bulletins that require DT data development.
5. DAH actions:
   Type I – None
   Type II – Develop DT data and make it available to operators.
6. Operator actions (apply to both SB Types):
   - Review SB incorporation on a tail number basis.
   - For incorporated SBs that rely on zonal inspections (i.e. no special inspections required based on DTE performed) reconcile any MPD structural inspection escalations.
   - For incorporated SBs that require DTI verify that DTI has been included in the Op Spec and include if not.


All Service Bulletins
1
Structural Service Bulletin?
NO
YES
No Action Required, SB is Not Documented on List
2
Does SB Affect or Create FC Structure?
NO
YES
3
Is SB Mandated by AD?
NO
YES
7
Does SB Require One-time Inspection?
YES
NO
8
Major Structural Design Change?
NO
YES
9
NDI Inspections Required?
NO
YES
4
Does SB Contains a Terminating Action?
NO
YES
10
Does SB contain DT data for both Baseline and Modification?
NO
YES
5
Does the Terminating Action Have DT data?
YES
NO
SB Data Complies with 121.1109/129.109 Req, Document on List
6
Does the SB address Safe Life Parts?
YES
NO
Develop Required DT data and Document on List

APPENDIX 10. Proposed Operator Letter to FAA Concerning Alterations

Date

Federal Aviation Administration
Transport Standards Staff ANM-115
1601 Lind Ave
Renton WA 98055-4056

Subject: STCs Installed on **"Blue Streak Airline"** Fleet.

Blue Streak Airline operates airplanes that are required to comply with 14 CFR 121.1109 (or 14 CFR 129.109). This rule requires that the structural maintenance programs be based on damage tolerance. One aspect of compliance to this rule is to demonstrate that certain Supplemental Type Certificates have compliant maintenance requirements. Blue Streak Airline has reviewed the airplanes that are required to be compliant according to the guidance provided in AC 120.AAWG and have determined that there are STCs that are incorporated on those airplanes which will require damage tolerance maintenance programs. **Blue Streak Airline** has made a list of these STCs and the Design Approval Holders of record and has attached that list to this letter. **Blue Streak Airline** requests that the FAA contact the DAH for each alteration and make them aware of their responsibility under 14 CFR 25.1825 or 25.1827. Further, **Blue Streak Airline** requests the FAA to notify us of any decision made by the DAH in regards to continued support of their STC under 14 CFR 25.1825 or 25.1827. We would be interested if the FAA could provide information in one of the following four categories.

(1) The DAH has an FAA approved maintenance program based on damage tolerance for this STC. Please contact the DAH for obtaining that information.
(2) The DAH is in the process of developing an FAA approved maintenance program based on damage tolerance for this STC. Please contact the DAH for information on when this data will be available.
(3) The DAH has decided that he will no longer support this STC and has submitted the engineering data and STC to the FAA. At this time the engineering data is available to persons who can demonstrate a need. Please file a FOIA request with the FAA ACO.
(4) The DAH has decided that he will no longer support this STC and has submitted the engineering data and STC to the FAA. The engineering data is not available to be distributed at this time.

Thank You

Blue Streak Airline

Attachment: List of STC Installed

APPENDIX 11. LIST OF SIGNIFICANT STCs

i) Passenger-to-freighter conversions (including addition of main deck cargo doors).
ii) Gross weight increases (increased operating weights, increased zero fuel weights, increased landing weights, and increased maximum takeoff weights).
iii) Installation of fuselage cutouts (passenger entry doors, emergency exit doors or crew escape hatches, fuselage access doors, and cabin window relocations).
iv) Complete re-engine or pylon alterations.
v) Engine hush-kits.
vi) Wing alterations such as installing winglets or changes in flight control settings (flap droop), and alteration of wing trailing edge structure.
vii) Modified skin splices.
viii) Antenna Installations
ix) Any alteration that affects several stringer or frame bays.
x) An alteration that covers structure requiring periodic inspection by the operator's maintenance program.
xi) An alteration that results in operational mission change that significantly changes the manufacturer's load or stress spectrum, e.g., passenger-to-freighter conversion.
xii) An alteration 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.
xiii) In general, attachment of interior monuments to FCS.

Appendix C: AC 25.1529-1 With Proposed Changes

Note: Revisions are italicized and underlined

U.S. Department Of Transportation
Federal Aviation Administration
Advisory Circular

Subject: INSTRUCTIONS FOR CONTINUED AIRWORTHINESS OF STRUCTURAL REPAIRS ON TRANSPORT AIRPLANES
Date: *Feb. 2006*
Initiated by: *AAWG AASR*
AC No: 25.1529-1
Change: *Draft revision*

1. **Purpose:** This Advisory Circular (AC) provides instructions to ensure continued airworthiness of structural repairs on transport category airplanes *which are not required to comply with 14 CFR Parts 121.1109 and 129.109 (Aging Airplane Safety Rule). For compliance to14 CFR Parts 121.1109 and 129.109 (AASR) AC 120.AAWG provides instructions to ensure continued airworthiness. This AC* ~~it~~ addresses the approval procedures to follow when making structural repairs to structure certificated under the damage tolerance requirements of 5 25.571 of the Federal Aviation Regulations (FAR), Amendment 25-45, and to type designs with Supplemental Inspection Documents (SIDs) which were based on these criteria. The methods provided herein are not the only means acceptable for showing compliance with the applicable portions of 5 25.1529 and Appendix H of Part 25. The Federal Aviation Administration (FAA) will consider other methods of compliance the applicant may elect to present.

2. Applicability:

3. **Related FAR Sections**. Sections 1.1, 21.31(c), 21.50, 25.571, 25.1529, and 43.16 of the FAR. Appendix H of Part 25. Appendix A of Part 43.

4. **Background**. The current industry procedure for repairing structural elements is to first classify the repair as either major or minor in accordance with the definitions set forth in 5 1.1 and Appendix A of Part 43. The FAA-approval procedures depend on the classification of the repair. The structure is then restored to the original certification status; either safe-life, fail-safe, or damage tolerant and approved in accordance with established procedures. The definitions of major and minor have historically been subject to widely varying application by maintenance and inspection personnel. In order to standardize the application of the term major repair, the FAA published a list of parts and types of repairs considered major in Civil Aeronautics Manual (CAM).18 in 1953. This was later adopted as Appendix A of Part 43. This standardized list of major repairs has in some cases resulted in the classification of minor repairs as major simply because the list has not been updated to include evolving airplane design and

construction techniques and it is not practical to tailor the list to individual airplane models. There is no attempt in this AC to redefine the terms major or minor as defined in Parts 1 and 43 of the FAR. Rather, the intent of this AC is to ensure damage tolerant structure will remain damage tolerant after it has been repaired.

The advent of damage tolerant design in modern transport category airplanes further complicated the approval procedures for repairs by introducing the need for additional testing and/or analysis in order to assess the long-term effects of repairs on damage tolerant structure. Although the repairs may be structurally sound and airworthy when completed, it is not practical in many instances to complete the damage tolerance evaluation for long-term airworthiness prior to returning the airplane to service. This AC 25.1529-1 8/I/91 necessitates an interim repair approval where the repair is found to be structurally sound relative to static strength but has not been analyzed for long-term airworthiness effects. The final approval of the repair is made shortly thereafter and before long-term fatigue effects are manifested. This AC provides guidance to airplane manufacturers and to those authorized to repair structures, in cases where this two-phase approval process is necessary.

5. Definition of Terms

a. Damage tolerance means that the structure has been evaluated to ensure that should serious fatigue, corrosion, or accidental damage occur within the operational life of the airplane, the remaining structure can withstand reasonable loads without failure or excessive structural deformation until the damage is detected.

b. Fail-safe means the structure has been evaluated to assure that catastrophic failure is not probable after fatigue failure or obvious partial failure of a single, principal structural element.

c. Safe-life means that the structure has been evaluated to be able to withstand the repeated loads of variable magnitude expected during its service life without detectable cracks.

d. Primary structure is structure that significantly contributes to the carrying of flight, ground, or pressure loads. It is also known as a structurally significant item (SSI).

e. Principal structural elements (PSE) are those elements of primary structure which contribute significantly to carrying flight, ground, and pressurization loads, and whose failure could result in catastrophic failure of the airplane.

f. Single load path is where the applied loads are eventually distributed through a single member, the failure of which would result in the loss of the structural capability to carry the applied loads.

g. Multiple load path is identified with redundant structures in which, (with the failure of individual elements) the applied loads would be safely distributed to other load-carrying members.

6. **GUIDANCE**. Appendix H of Part 25 specifies the general requirements for the preparation of instructions for continued airworthiness as required by § 25.1529. The following guidance is to be used in conjunction with Appendix H and other related regulations.

a. Structural Repair Manual. The applicant should include in the maintenance instructions required by Appendix H, paragraph H25.3 (b) a structural repair manual (SRM) which describes the types of structural repairs anticipated in service. This SRM should be reviewed and approved by the FAA.

b. Principal Structural Elements. The SRM should identify all PSE's and primary structure requiring approved repair data. Examples of PSE's may be found in Advisory Circular 25.571-IA, Damage Tolerance and Fatigue Evaluation of Structure, dated 3/5/86.

c. Repair Documentation. Any repair to a PSE or primary structure, including the removal of cracks and corrosion, requires some form of approval whether deemed "major" or "minor" under the definition of Part 1 and the provisions of Part 43. The SRM should provide criteria for determining if the repair warrants FAA engineering approval. In general, repair to a PSE or primary structure requires FAA engineering approval. Such approval is usually accomplished by the FAA, a designated engineering representative or a Special Federal Aviation Regulations (SFAR) 36 authorized staff.

d. Substantiating Repairs. Additionally, the SRM should provide guidance to repairers as to what substantiating data is necessary to show that the repair complies with certification requirements. This guidance should address repairs to PSE's and primary structure for which no FAA-approved or acceptable data currently exists. It should identify the applicable certification requirements and describe acceptable methods for demonstrating compliance. The SRM must tell the repairer that FAA approval is required for such repairs.

e. Basis for Inspection Program. The basis for an inspection program for repairs certified herein will be contained in a future revision to AC 25.571-1A.

f. Two Stage Structural Evaluation.

(1) Applicants may elect to allow two-stage repair approval in which the basic structural evaluation shows that the repair will meet immediate and short term strength requirements (ultimate strength) but a more extensive investigation is required to show long-term strength requirements. If the applicant elects this option he must schedule the completion of the evaluation such that the airplane is not subjected to the risk of structural failure due to fatigue in the interim. For example, a two-stage evaluation may be recommended where;

(i) A static structural strength evaluation is made prior to release of the airplane into service with a stated time for completion of the damage tolerance evaluation, and

(ii) A damage tolerance evaluation of the repair is made within the prescribed time period after this interim release. The final evaluation must reflect any changes in the related inspection program, including threshold, interval, and inspection procedure.

(2) Final repair approval should not be made until a damage tolerance evaluation has been completed and has shown that the repair is adequate to assure continued airworthiness. The time period established for completion of the approval should be based on technical, logistic and recordkeeping considerations. Due to the logistics and recordkeeping requirements and the ability of the operator to realistically track follow-on technical approval programs, a time period for completion of the approval process that does not exceed 12 months is generally adequate for most structural repairs. This time period is justified based on the assumed inherent crack free performance of structure designed to maintain its initial strength level for the lifetime of the structure.

(3) Procedures must be established by the operator as agreed upon by the manufacturer, with approval from the cognizant Aircraft Certification Office, which would assure timely completion of the approval process. These procedures should also provide for audits to ensure that interim repairs are finalized as scheduled.

g. Special Qualifications. Guidance should be provided with regard to the qualifications of persons evaluating and approving repairs made to certain PSE's, which have special design considerations. For example, a particular design may include certain PSE's having damage tolerant structure requiring a person who has comprehensive knowledge of the specific design philosophy, loading spectrum, and fracture mechanics techniques used in that particular design. Due to these qualifications of the specialist, responsibility for the assessment may be restricted to staff members of the airframe manufacturer, certain designated engineering representatives, the FAA, or certain SFAR 36 engineering staff personnel. The FAA Aircraft Certification Offices should provide guidance in regard to qualifications of personnel.

h. Logic Diagram. The logic diagram in Figure 1 is provided to assist in the determination of when FAA Engineering approval is required for a repair to damage tolerant structure. The decision process begins when it has been determined that structural damage has occurred to a PSE.

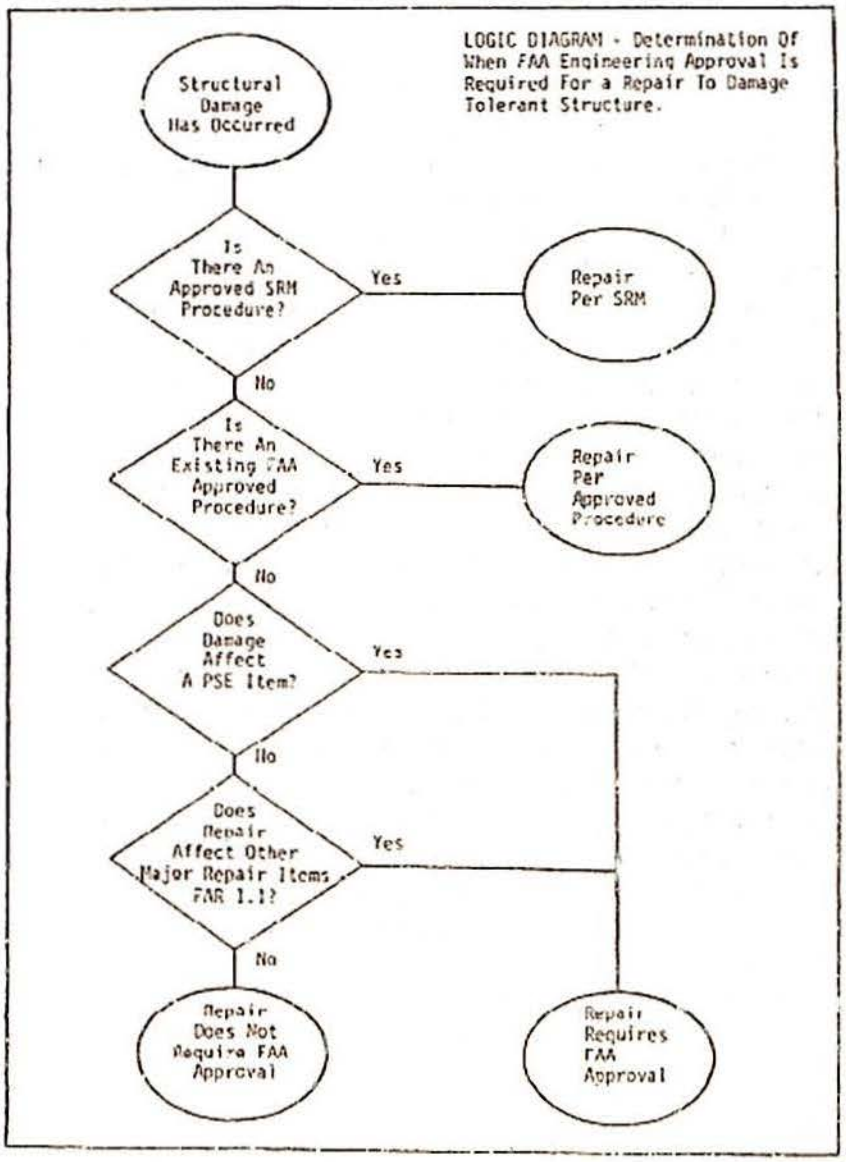


Figure 1

The following guidance is offered for use with the logic diagram:

(1) Determine if the repair can be accomplished using standard methods defined in the SRM for the particular airplane. These standard repair methods may be simple or complex; for example:
  - (i) Blend out - local.
  - (ii) Replacement with identical part.
  - (iii) Oversize attachment.
  - (iv) Reduction of edge distance.

(2) For damage not covered by an SRM procedure determine if an FAA approved repair exists or if other means of repair acceptable to the FAA exists; for example:

(i) FAA approved repair.
(ii) Service Bulletin (FAA or DER approved).
(iii) All operators letter (FAA or DER approved).
(iv) FAR 36 repair previously approved.

(3) Once it has been determined that the damage or repair does not affect primary structure (PSE) then it must be determined whether it affects other criteria in the major repair definition of 5 1.1; i.e., systems, weight and balance, aerodynamics, or airplane performance.

(4) If it has been determined that a repair must be submitted for FAA approval, and cannot be shown to have prior approval or other acceptable data, it may be approved by the FAA, a designated engineering representative, or an SFAR 36 authority.

Appendix D: AAWG Meetings and Attendance Records

1. Meeting Dates and Venues

AAWG Meetings

July 23, 2003	--	Atlanta Georgia (Delta Air Lines)
June 30, 2004	--	Long Beach CA (FAA)
March 1, 2005	--	Miami FL (Airbus)
October 26, 2005	--	Memphis TN (FedEx)
January 25, 2006	--	Miami FL (Airbus)
May 3, 2006	--	Long Beach CA (Boeing/FAA)

Task Group Meetings

Ad-hoc Task Planning Group		
September 15-17, 2003	–	Seattle Washington (Boeing)
November 11-14, 2003	–	London England (British Airways)
March 29-April 2, 2004	–	Toulouse France (Airbus)
May 17-21, 2004	–	Memphis Tennessee (FedEx)
Task Group Meetings		
July 12-16, 2004	–	Gatwick England (CAA-UK)
September 20-21, 2004	–	Long Beach (Boeing)
November 15-19, 2004	–	Brussels Belgium (FAA)
January 31- Feb 4, 2005	–	Miami FL (Airbus)
March 14-18, 2005	–	Hamburg GE (Airbus)
May 2-6, 2005	–	Long Beach CA (FAA/Boeing)
June 13-19, 2005	–	Collioure FR (Airbus)
September 26-30, 2005	–	Seattle WA (Boeing)
November 7-11, 2006	--	Bristol UK (Airbus)
January 23-27, 2006	--	Miami FL (Airbus)
March 6-10, 2006	--	Seville SP (Airbus)
May 1-5, 2006	--	Long Beach CA (FAA/Boeing)

2. AAWG Organizational Meeting Attendance

Organization	MEETING DATE					
	Jul 2003	Jun 2004	Mar 2005	Oct 2005	Jan 2006	May 2006
Airborne Express (M)	X	X	X	X		X
Airbus (M)	X	X	X	X	X	X
ALPA						
America West						
American Airlines (M)	X	X		X	X	X
ATA (M)				X		
Boeing (M)	X	X	X	X	X	X
British Aerospace (M)	X					
British Airways (M)	X	X		X	X	
CAA-UK(JAA) (M)	X					
Continental Airlines (M)	X	X	X	X	X	X
Delta Air Lines (M)	X	X				
Evergreen Aviation						
FAA (M)	X	X	X	X	X	X
Federal Express (M)	X	X	X	X	X	
Fokker Services						
IATA						
Japan Air Lines		X				
Lockheed (M)	X					
Northwest Airlines (M)		X	X	X	X	
SIE		X				X
TIMCO		X				
United Airlines (M)	X	X	X		X	X
UPS (M)	X	X	X	X		
US Airways (M)	X	X		X	X	

(M) – AAWG Voting Member

3. AAWG Task Planning Group Organizational Attendance

	MEETING DATES			
Organization	**Sep 2003**	**Nov 2003**	**Mar 2004**	**May 2004**
Airborne Express	X	X		X
Airbus	X	X	X	X
American Airlines	X	X	X	X
ATA				
Boeing	X	X	X	X
British Airways	X	X	X	X
Continental Air Lines	X	X	X	X
Delta Air Lines	X	X	X	X
EASA		X	X	
FAA	X	X	X	X
Federal Express	X	X		X
Gulfstream		X	X	
Japan Air Lines	X	X	X	X
Lockheed			X	X
Northwest Airlines	X	X	X	X
SIE				
TIMCO				
United Airlines	X			
UPS	X	X		X
US Airways	X	X	X	X

4. AAWG Task Group Organizational Attendance

	MEETING NUMBER											
Organization	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Airborne Express		X		X		X						
Airbus	X	X	X	X	X	X	X	X	X	X	X	X
American Airlines	X		X	X	X	X	X		X	X	X	X
ATA												
Boeing	X	X	X	X	X	X	X	X	X	X	X	X
British Airways	X	X	X	X	X		X	X	X	X	X	X
Continental Air Lines												
Delta Air Lines	X	X										
EASA	X	X	X	X								
FAA	X	X	X	X	X	X	X	X	X	X	X	X
Federal Express	X	X	X	X		X	X	X	X	X	X	
Gulfstream												
Japan Air Lines	X	X		X				X				
Lockheed												
Northwest Airlines	X	X	X	X	X	X	X	X	X	X	X	
SIE						X						X
TIMCO												
Transport Canada								X				X
United Airlines												
UPS	X	X	X	X	X	X	X	X	X			
US Airways	X	X								X		

No.	Date	Venue
1	July 12-16, 2004	Gatwick England (CAA-UK)
2	September 20-21, 2004	Long Beach (Boeing)
3	November 15-19, 2004	Brussels Belgium (FAA)
4	January 31- Feb 4, 2005	Miami FL (Airbus)
5	March 14-18, 2005	Hamburg GE (Airbus)
6	May 2-6, 2005	Long Beach CA (FAA/Boeing)
7	June 13-19, 2005	Collioure FR (Airbus)
8	September 26-30,2005	Seattle WA (Boeing)
9	November 7-11, 2006	Bristol UK (Airbus)
10	January 23-27, 2006	Miami FL (Airbus)
11	March 6-10, 2006	Seville SP (Airbus)
12	May 1-5, 2006	Long Beach CA (FAA/Boeing)

A REPORT OF THE AIRWORTHINESS ASSURANCE WORKING GROUP

RECOMMENDATIONS CONCERNING ARAC TASKING FR Doc. 04-10816

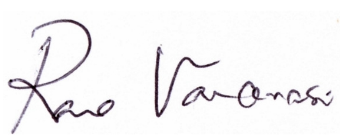
RE: AGING AIRPLANE SAFETY FINAL RULE

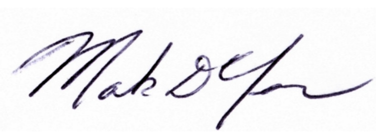
14 CFR 121.370a AND 129.16

FINAL REPORT

October 28, 2005

SIGNED BY





Rao Varanasi
Co-Chairperson, AAWG
Boeing Commercial Airplanes

Mark Yerger
Co-Chairperson, AAWG
Federal Express

REVISION PAGE

LTR	DATE	CHANGE	PAGES ADDED	PAGES DELETED	PAGES CHANGED	APPROVED BY

Table of Contents

Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:

Deleted: Deleted:

Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:

List of Figures

Deleted:

Deleted:

Deleted:

List of Tables

.

Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:
Deleted:

List of Abbreviations

The following abbreviations are used throughout this report

AASA	Aging Airplane Safety Act of 1991
AASFR	Aging Airplane Safety Final Rule
AASIFR	Aging Airplane Safety Interim Final Rule
AATF	Airworthiness Assurance Task Force
AAWG	Airworthiness Assurance Working Group
AC	Advisory Circular (FAR)
ACO	Aircraft Certification Office
AD	Airworthiness Directive
AIA	Aerospace Industries Association of America
ALS	Airworthiness Limitation Section
ARAC	Aviation Rulemaking Advisory Committee
ATA	Air Transport Association of America
ATC	Amended Type Certificate
CAA	Civil Aviation Authority
CAR	Civil Airworthiness Requirements
CFR	Code of Federal Regulations
DAH	Design Approval Holder
DSG	Design Service Goal
DT data	Damage Tolerance Data
DTE	Damage Tolerance Evaluation
DTIP	Damage Tolerance Inspection and Procedures
EASA	European Aviation Safety Agency
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
ISP	Inspection Start Point
LOV	Limit of Validity
MPD	Maintenance Planning Document
NDI	Non Destructive Inspection
NPRM	Notice of Proposed Rulemaking
OEM	Original Equipment Manufacturer
PMI	Principal Maintenance Inspector (FAA)
RAG	Repair Assessment Guidelines
RAM	Repairs, Alterations and Modifications
RAP	Repair Assessment Program
SB	Service Bulletin
SMP	Structural Modification Point
SRM	Structural Repair Manual
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

List of References

The following is provided as a means to access current rules and regulations together with previous ARAC Recommendations from the AAWG. Documents noted by an (*) are available at the following web site.

http://www.faa.gov

1. Title 14 of the Code of Federal Regulations (14 CFR): The following Regulations are referenced in this report:

a. Part 21, §21.101*
b. Part 25, §§ 25.571*, 25.1529*
c. Part 43, §§ 43.13*, 43.16*
d. Part 91, § 91.403*
e. Part 121, §§ 121.368*, 121.370*, 121.370a*
f. Part 129, §§ 129.16*, 129.32*, 129.33*

2. Advisory Circulars (AC): The following Advisory Circulars are reference in this report:

a. AC 21.101-1, Change Product Rule*
b. AC 25.571-1, Damage Tolerance and Fatigue Evaluation of Structure*
c. AC 25.571-1A, Damage Tolerance and Fatigue Evaluation of Structure*
d. AC 25.571-1B, Damage Tolerance and Fatigue Evaluation of Structure*
e. AC 25.571-1C, Damage Tolerance and Fatigue Evaluation of Structure*
f. AC 25.1529-1, Instructions for Continued Airworthiness of Structural Repairs on Transport Airplanes*
g. AC 91-56A, The Continued Airworthiness of Older Airplanes*
h. AC 91-56B, The Continued Airworthiness of Older Airplanes*
i. AC 120-73, Damage Tolerance Assessment of Repairs to Pressurized Fuselages*

3. Other Documents referred to in this report:

a. A Final Report of the AAWG – Continued Airworthiness of Structural Repairs*
b. A Report of the AAWG – Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Airplane Fleet*
c. A Report of the AAWG - Recommendations For Regulatory Action To Enhance Continued Airworthiness Of Supplemental Type Certificates*
d. Repair Assessment Guidelines, FAA Approved Model Specific Guideline Documents**
e. FAA Approved Model Specific Supplemental Inspection Documents**
f. ATA Report 51-93-01 - Structural Maintenance Program Guidelines For Continuing Airworthiness***
g. ATA Response to FAA Docket 1999-5401 Dated May 5, 2003***
h. Federal Register/Vol. 69, No. 146/Friday, July 30, 2004/Rules and Regulations Fuel Tank Safety Compliance Extension (Final Rule) and Aging Airplane Program Update (Request for Comments). Page 45936*
i. A Report to the AAWG - Structures Task Group Guidelines Document, June 1996*
j. Federal Register/ Vol. 67, No. 235 / Friday, December 6, 2002 / Rules and Regulations Aging Airplane Safety

** Various manufacturers publish these documents. Please contact those manufacturers to determine the general availability of the documents.

*** Please contact the ATA.

Executive Summary

On May 13, 2004, the FAA published a new ARAC tasking and assigned it to the Transport Airplane and Engine Issue Group/Airworthiness Assurance Working Group. The Tasking requested Industry assistance in preparing guidance material for certificate holders wishing to show compliance to the Aging Airplane Safety Final Rule, 14 CFR 121.370a and 129.16. The Tasking consisted of four sub-tasks to be accomplished in two phases. In Phase 1, tasks 1, 2, and 3 are completed; in Phase 2, task 4 is completed.

In the process of completing the Task, several recommendations and conclusions were reached. In addition an Advisory Circular was developed in concert with the requirements of the Tasking. In the process of developing the tasking issues, the AAWG reached a total of 22 Conclusions and Recommendations.

Even though 14 CFR 121.370a and 129.16 could be construed to be applicable to repairs alterations and modifications to composite structure, the AAWG did not specifically develop guidelines for this particular type of structure. There were three principal reasons for this: (1) there is not a significant amount of composite primary structure on airplanes today; (2) most of that structure is on airplanes that were certified to Amendment 45 or later; and (3) the certification process in regards to damage tolerance for composite structure is significantly different than that of metallic structure and are adequately covered by AC 20-107A.

Compliance with the new Aging Airplane Safety Final Rule, 14 CFR 121.370a and 129.16 will require operators and DAHs to cooperatively develop data that, in some cases, does not currently exist. The AAWG recommends that this be accomplished through model specific STGs for both baseline structure as well as for repairs, alterations and modifications. Operators of applicable airplanes must have this data to show compliance by December 20, 2010. To this end, all updates to existing data should be published by December 18, 2009.

<u>Task 1 & 2 Conclusions and Recommendations (Repairs and Alterations/Modifications)</u>

The AAWG developed draft AC 120-AAWG to document the process for assessing repairs to fatigue critical structure. The proposed AC addresses repairs to both baseline structure as well as repairs to alteration and modifications. The AAWG believes that the proposed AC 120-AAWG contains sufficient guidance for DAHs to develop a Compliance Document which would support operator compliance with the AASFR for repairs.

Key to initiating this process is the identification of fatigue critical structure for each applicable airplane model. Repairs to the fatigue critical structure will need to be assessed for damage tolerance. Depending on the certification level of the aircraft

model and whether installed repairs are already covered by DT data, this may require a survey of the aircraft.
The conclusions and recommendations (***Bold Italicized***) from the AAWG tasking regarding repairs and repairs to alterations are documented in Sections 3 through 5 of this report. These are summarized below.

1. SSID programs and ALS were developed to address the un-repaired fatigue critical structure and do not consistently provide instructions for repairs to that structure.

2. The AAWG recommends that existing SBs, SRM, SSID programs and ALS programs for each applicable airplane be reviewed and updated to include DT data for all repairs to fatigue critical baseline structure as well as repairs to alterations and modifications by December 18, 2009.

3. The AAWG concluded that there are repairs and modifications to structural components susceptible to fatigue contained in the AMM and/or CMM and that these repairs and modifications are not under the same level of scrutiny that other repairs are subjected to.

4. The AAWG recommends that the FAA issue additional tasking to the ARAC to investigate the status of the AMM and CMM, and make appropriate recommendations.

5. The AAWG concluded that the development of RAG documents for the fuselage pressure boundary (fuselage skin, door skins, and bulkhead webs) provides vital information for operators to comply with 14 CFR 121.370 and 129.32 for the applicable airplanes.

6. The AAWG recommends that a generalized RAP program (includes greater coverage of fatigue critical structure than the pressurized boundaries) be considered and developed, if technically and economically feasible.

7. For those airplanes certified to Amendment 45 or later, where repairs to the fuselage pressure boundary were not provided with DT data, it is recommended that a Fuselage RAP program be developed in accordance with the guidance provided in AC 120-73, if economically feasible.

8. The AAWG recommends that the TAEIG task the AAWG to revise AC 120-AAWG to include a process for developing damage tolerance based maintenance inspections for alterations and modifications. A copy of the proposed tasking is included in Appendix E of this report.

9. The AAWG reviewed draft AC91-56B and made the determination that the guidance material does not provide adequate directions for an entity seeking compliance to AASFR.

10. The AAWG recommends that AC 91-56B be revised as delineated in Sections 2 and 3 of this report. A full draft of a proposed revision of AC 91-56B is included in Appendix C.

11. The AAWG reviewed AC 25.1529-1 and determined that the guidance material would not support compliance to the AASFR and further did not follow industry-accepted practice.

12. The AAWG recommends that AC 25.1529-1 be cancelled and incorporated in pertinent part into the proposed AC 120-AAWG.

13. The AAWG Recommends that AC 120-AAWG be promulgated as a means of compliance to 14 CFR 121.370a and 129.16 with respect to repairs. A copy of this AC is contained in Appendix B.

Task 3 Conclusions and Recommendations (WFD for RAMs)

14. For WFD evaluation, the AAWG concluded that the following two situations should be addressed:

a. The structural configuration of the RAM itself, if it is susceptible to WFD;

b. The effect of the RAM on baseline structure susceptible to WFD.

15. WFD actions for baseline structure should be defined prior to requiring an assessment of the effect of the RAM.

16. The determination of any maintenance actions required to preclude WFD should be done in context with the procedure defined in AC 120-AAWG for determination of the damage tolerance requirements for the RAM:

a. For those airplanes that need a survey to address DT for repairs, the WFD assessment should occur within the same timeframe (action and implementation plan;

b. For newer airplanes that will require WFD analysis for repairs and alterations, (e.g. 14 CFR Part 25 Amdt. 54 and beyond), the WFD action should occur when the airplane reaches DSG

c. For newer airplanes that only require WFD for alterations (e.g. 14 CFR Part 25 Amdt. 96 and beyond) the WFD action should occur at certification

17. Existing DAH documents, like the SRM and RAP, should be updated, in a timely fashion, to include consideration for WFD damage scenarios to support compliance to 121.WFD, where operation past DSG is defined.

18. To complete Task 3, the AAWG recommends that the TAEIG task the AAWG to assemble a group of technical experts for the development of the required technical basis on how to address WFD for RAMs. The work product of this activity would be material for inclusion in either FAA Advisory Circular 120-AAWG or yet another, to be determined, AC. A copy of the proposed Tasking is included in Appendix E of this report.

Task 4 Conclusions and Recommendations (Model Specific Programs)

19. The AAWG concurs with the ARAC Tasking in that it should oversee the timely development and implementation of model specific Compliance Documents and new and updated model specific data to support operator compliance.

20. The AAWG concurs that model specific STGs should be formed to identify the fatigue critical structure, and review existing data that could be used in support of compliance with the AASFR and that the AAWG oversee that activity.

21. The AAWG concluded that the cooperation of the Type Certificate Holders and the Design Approval Holders is necessary for operators to be able to comply with the AASFR.

22. The AAWG recommends that the DAH Model Specific Compliance Document, as delineated in AC 120-AAWG, be published by December 20, 2008, and the new and updated model specific data to support operator compliance be published by December 18, 2009. In addition, the AAWG recommends that the AAWG oversee the development of this data as delineated in Appendix E.

1. Introduction

A. New Tasking

On May 13, 2004, the FAA published a new ARAC tasking and assigned it to the Transport Airplane and Engine Issue Group/Airworthiness Assurance Working Group. The Tasking requested Industry assistance in preparing guidance material for certificate holders wishing to show compliance to the Aging Airplane Safety Final Rule, 14 CFR 121.370a and 129.16. The Tasking consisted of four sub-tasks to be accomplished in two phases. In Phase 1, Tasks 1, 2, and 3 are completed; in Phase 2, Task 4 is completed. The complete tasking statement is contained in Appendix A and summarized below.

1) Phase 1 – Preparation of Guidance Material

Phase 1 of the task requirements require the definition of guidance material and recommendations on the following subjects.

a) Task 1 – Repairs to Fatigue Critical Structure and Repairs to Alterations and Modifications

In Section 2 of this report, the AAWG has developed the rationale for the guidance material that will enable the operators to develop damage tolerance maintenance programs for repairs to fatigue critical structure and repairs to alterations and modifications. The actual proposed Advisory Circular is contained in Appendix B of this report. The FAA requested several subtask be evaluated in the development of the advisory material. These evaluations were conducted and the appropriate information included.

b) Task 2 – Alterations and Modifications

In Section 3 of this report the AAWG provides recommendations to the FAA on appropriate means to develop damage tolerance based maintenance programs for alterations and modifications. These recommendations are in the form of a request for an additional tasking to develop an amended Advisory Circular to include a process to develop the required programs

c) Task 3 – Consideration of Widespread Fatigue Damage for RAMs

In Section 4 of this report, the AAWG provides recommendations to the FAA on appropriate means to include the consideration of WFD prevention for installed repairs, alterations and modifications. These recommendations are in the form of a request for an additional tasking to develop an amended Advisory Circular to include a process to develop the required programs

2) Phase 2 – Task 4 Preparation of Compliance Data

Section 5 of this report briefly describes the expected process the industry will use to develop and implement the required programs.

B. 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:

ABx Air*
Airbus *
Airline Pilot's Association
American Airlines*
Air Transport Association
American West Airlines
Boeing Commercial Airplanes*
British Airways*
Continental Airlines*
Delta Air Lines Incorporated*
Evergreen International Airlines
Federal Aviation Administration*
Federal Express*
Fokker Service
International Air Transport
Japan Air Lines*
EASA*
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. A list of meeting venues and meeting attendance is documented in Appendix F respectively.

2. Task 1 - Development of Guidance Material for Repairs to Fatigue Critical Structure

A. Introduction

A significant change in the airworthiness standards for fatigue occurred in October 1978 with amendment 25-45 wherein §§ 25.571 and 25.573 of 14 CFR Part 25 were revised and deleted respectively. This change involved removing the fail-safe option in its entirety and establishing a new requirement to develop damage tolerance based inspections wherever practical. The fatigue strength approach was retained as a default option to be used only if the damage tolerance approach was shown to be impractical.

The same events and reasoning that drove the changes to airworthiness standards for new airplane also influenced the strategy adopted to ensure the continued airworthiness of the existing fleet. There was increasing concern with respect to existing older airplanes that had been certified in accordance with the fail-safe requirements of CAR 4b.270. Eleven large transport models were specifically identified as needing the most attention and it was decided that damage tolerance based inspection programs should be developed and implemented for these airplanes. These inspections were meant to supplement existing maintenance inspections and thus these programs were referred to as Supplemental Structural Inspection Programs (SSIPs) and the inspection requirements were documented in Supplemental Inspection Documents (SIDs). It was further agreed that the SIDs would be developed by the Original Equipment Manufacturers on a voluntary basis and then mandated by Airworthiness Directive (AD). Guidance for developing the SSIPs was published by the CAA in Airworthiness Notice No. 89, Continuing Structural Integrity of Transport Aeroplanes dated August 23, 1978 and by the FAA in Advisory Circular No. 91-56, Supplemental Structural Inspection Program for Large Transport Category Airplanes dated May 6, 1981. Subsequently SSIPs were developed and mandated by AD for the eleven aging models.

The damage tolerance concept has been adopted from the late 70s for the design, certification, and continued airworthiness of the new and existing aircraft models. However, these requirements have generally only been applied to the baseline structure. No system was in place requesting that repairs to Principal Structural Elements on these aircraft be evaluated to damage tolerance principles. The majority of these repairs were designed to an equal or better static strength requirement.

In response to accidents attributed in part to the aging of the airplane involved, the FAA sponsored in June 1988 a conference on aging airplane and as a result a task force was established representing the interests of the airplane operators, airplane manufacturers, regulatory authorities and other aviation representatives. In addition to other recommendations this task force specifically recommended that the damage tolerance of repairs should be considered. The following actions have been launched:

- The FAA published AC 25.1529-1 in 1991 to provide instructions to ensure continued airworthiness of structural repairs. This AC addresses the approval procedures to follow when making structural repairs to structure certificated under the damage tolerance requirements (including type designs with SIDs which were based on these criteria).

- In direct response to the task force recommendations changes were made to parts 91, 121, 125 and 129 of Title 14 of the CFR in April 2000 to require operators to incorporate damage tolerance based inspections for existing and future repairs to the fuselage pressure boundary for the eleven aging models previously identified. Other models and repairs to other structure were not addressed by the change.

- Model specific ADs have been issued on some of the eleven aging models that address repairs through the existing SSIDs.

Since the introduction of damage tolerance requirements in 1978, and its industry implementation over the years, the compliance status of structural repairs is rather complex to summarize:

- Damage tolerance based inspections have been incorporated for existing and future repairs to the fuselage pressure boundary of the eleven aging models. Existing and new repairs outside pressure boundary may not have been evaluated for damage tolerance.

- New repairs applied to structure certificated under the damage tolerance requirements should have been assessed for damage tolerance, and inspections incorporated as necessary to ensure their continued airworthiness.

1) Fatigue Critical Structure

14 CFR 121.370a/129.16 of the Aging Airplane Safety Final Rule (AASFR) requires operators to incorporate into their maintenance program damage tolerance based inspections and procedures for structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. This category of structure is referred herein as “fatigue critical structure”. The fatigue critical structure includes structure associated with alterations and modifications that are susceptible to fatigue cracking that could contribute to a catastrophic failure. It should be noted that in developing 14 CFR 121.370a/121.16 requirements, it was the intent of the FAA that the fatigue critical structure as defined in 14 CFR 25.571 must be assessed for damage tolerance.

2) Repairs to Fatigue Critical Structure

14 CFR 121.370a/121.16 also requires that repairs to the fatigue critical structure be assessed for damage tolerance. Repairs that are of interest for compliance to the AASFR are those repairs adversely affecting the fatigue life and inspection of the

fatigue critical structure. To preclude unnecessary DT assessments of repairs, the AAWG has identified certain types of repairs commonly made to the fatigue critical structure that have no adverse affect on the fatigue life and inspection of the structure. Task 1 of the FAA tasking requires an AC be written to provide guidance for developing DT data that operators can use for addressing repairs made to the fatigue critical structure. The AAWG has established AC 120-AAWG "Damage Tolerance Inspections for Repairs" to accomplish this task.

a) Repair Definition

For the purpose of this AC, a repair is defined as the restoration of an item to a serviceable condition in conformity with an approved standard.

The AC establishes provides guidance for determining when repairs need to be evaluated and which repairs will require evaluation. The AC will specify that the evaluation for these repairs be based on 14 CFR 25.571 and AC 25.571-1x (dependant on airplane certification level) and other guidance specific to repairs.

Even though 14 CFR 121.370a and 129.16 could be construed to be applicable to repairs alterations and modifications to composite structure, the AAWG did not specifically develop guidelines for this particular type of structure. There were three principal reasons for this: (1) there is not a significant amount of composite primary structure on airplanes today; (2) most of that structure is on airplanes that were certified to Amendment 45 or later; and (3) the certification process in regards to damage tolerance for composite structure is significantly different than that of metallic structure and are adequately covered by AC 20-107A.

b) Common repairs not affecting the fatigue life and or inspection of fatigue critical structure

For the purposes of the AC, existing repairs that need to be considered are those repairs that reinforce fatigue critical structure (e.g. restore strength); this typically excludes maintenance actions such as blend-outs, plug rivets, trim-outs, etc. The reason behind this limitation is that these maintenance actions are difficult to detect on the airplane and that records of such repairs are not normally kept past the next maintenance visit.

However, after December 20, 2010, blendouts, trim-outs, etc. that are beyond published DAH limits will require damage tolerance assessment as part of the compliance requirements to the AASFR.

c) Airplane Maintenance Manual/Component Maintenance Manual Restorations and Reworks

Manufacturers produce and distribute maintenance manuals for reworks, restorations and maintenance tasks for structural components conducted on and off airplane. The data and procedures contained in these manuals are FAA accepted procedures and have not necessarily been FAA approved.

The Airplane Maintenance Manual (AMM) directs maintenance tasks that can be accomplished on-airplane. This includes items such as lubrication system functional checks and servicing of the airplane. Structure repairs and modifications are not generally included in this manual except under special circumstances.

The Component Maintenance Manual (CMM) directs maintenance of components off-airplane. The maintenance tasks contained in this manual establishes accepted procedures for restoring a structural component to a serviceable state. As such, rework allowables along with refinishing procedures are often contained in this manual. Airlines can use this manual to restore components such as flap tracks, hydraulic actuators, and other components to a serviceable state without formal FAA approval.

The AAWG discussed whether or not reworks and restorations conducted under the provision of an AMM or CMM required consideration under the requirements of 14 CFR 121.370a/129.16 for the establishment of DT data. The AAWG concluded that it would be quite difficult to include these component reworks and restorations for the following reasons.

- The reworks and restorations within the limits contained in the DAH published AMM/CMM are reviewed by engineering and have not been known to adversely affect the life of the components.
- Certificate Holders are routinely allowed to modify the AMM/CMM based on service history with or without consulting the OEM. This has resulted in differing configurations for different certificate holders making the determination of a reworked baseline configuration difficult if not impossible to determine.
- A restored component, on airplane, would have no physical attributes to indicate that it had been reworked.
- Procedures for tracking the life or service history of a component, even if serialized, have not always been established or followed.
- In some cases a rework record of the component is not obtainable.
- Components from one airline could be interchanged with another airline.

After considering these points, the AAWG concluded that this issue should not be considered under the requirements of 14 CFR 121.370a/129.16 since inclusion of these reworks and restorations would be impossible to assess for compliance by December 20, 2010. The AAWG however believes that further review on this subject is advisable and recommends that the FAA issue a tasking to ARAC to investigate the status of the AMM and CMM and make appropriate recommendations.

d) Repairs to Removable Structural Components

Fatigue critical structure may include structure on removable structural parts or assemblies that can be exchanged from one aircraft to another (e.g. door assemblies, flight control surfaces, etc.). Therefore, repairs to such fatigue critical structure also require assessment for damage tolerance per 14 CFR 121.370a/121.16. While the general approach to assessment of these repairs is no different than for repairs to fixed structure, the AAWG found that removable structural parts present unique issues. These issues include:

- During their life history, these parts may not have had their flight times recorded on an individual component level. Additionally, they may have been removed and reinstalled on different airplanes multiple times. These actions may make it impossible to determine the actual age or total hours/cycles of a component or of a repair to a component. It also makes assigning a conservative age based on the component manufacturing date difficult (as is often done with fixed structure).

- Due to lack of clear guidance, there has been confusion in the industry regarding the need to track individual affected components under programs such as SSID or ALS. In many cases, the program rules could be interpreted to mean all requirements were tracked at the aircraft level even though some individual components were affected.

As a result of these findings, the AAWG concluded that additional guidance was necessary for repairs to removable structural components that were affected by the requirements of 14 CFR 121.370a/129.16. This guidance was included in AC 120-AAWG and addressed the issues listed above. In keeping with the theme of the tasking, a goal was to also provide guidance that gives flexibility and reduces operator burden when implementing DT data for repairs to structural components.

The guidance for removable structural components uses the same DT data development and implementation process applied to repairs on fixed structure; however, it gives tracking guidance and methods for conservatively assigning a component age. In developing this guidance, the AAWG considered existing industry approved recommendations for addressing removable structural components (Reference (3.f) – ATA Report 51-93-01, Section 4.6)

B. Task 1 Elements

Within Task 1, ARAC requested that the AAWG review and comment on several elements in preparation for the development of advisory material. The AAWG reviewed and commented on each of these elements below.

1) AC 91-56B Recommendations

The AAWG was requested to review the Draft AC 91-56B (Reference (2.h)) and assess its ability to provide the necessary guidance for an entity (more than just operator) that is seeking compliance to 14 CFR 121.370a/129.16. In Task 1, the Tasking requests ARAC to do the following for repairs:

In the process of drafting the AC, the ARAC should assess the effectiveness of AC 91-56B to provide guidance to TC and STC holders for developing damage-tolerance-based inspections and procedures for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The ARAC should do the following:

- ***Assess the effectiveness of AC 91-56B to support Industry compliance with the AASIFR with respect to repairs.***
- ***Document any improvements to the AC that would provide better direction with respect to the guidance for TC and STC holders in their development of damage-tolerance-based inspections and procedures for repairs.***

In Task 2, the ARAC was also requested to assess the effectiveness of Draft AC 91-56B to provide guidance for an STC holder in seeking compliance with 14 CFR 121.370a/129.16 for alterations and modifications, and provide recommended changes. While the specific discussion of the AAWG's findings are included in Section 3 of this report, the overall findings and recommendations were the same. Therefore, the recommended changes to Draft AC 91-56B associated with Task 2 were included in this section to avoid duplication or confusion.

a) Discussion of Proposed Changes

The AAWG reviewed Draft AC 91-56B and made a determination that the guidance provided did not provide adequate direction for an entity seeking compliance to 14 CFR 121.370a/129.16. The changes incorporated into Draft AC 91-56B did not address a variety of technical and programmatic issues that an entity would need to address for compliance to the rule. The results of trying to follow the Draft AC 91-56B would most likely result in a varying degree of compliance throughout the industry.

In making comments to the AC, the AAWG viewed Draft AC 91-56 as a top-level roadmap to the aging airplane programs that briefly describe the various programs and points to other ACs that provide specific guidance for each of the respective aging airplane programs. In support of this, the AAWG has developed a Draft AC 120-AAWG that provides guidance to the both the DAH and the operator on an acceptable means of compliance to 14 CFR 121.370a/129.16.

Further differences exist between the new FAA tasking contained in Federal Register Document 04-10816, dated 05-13-04, and the Draft AC 91-56B. The release of the new tasking reflects the FAA's current opinion of applicable structure that requires damage tolerance-based inspection program in accordance with the AASFR, 14 CFR 121.370a/129.16.

i. The Draft AC 91-56B reflects the wording of the Interim Final Rule Reference (3.j), that requires a damage tolerance-based inspection program for all major repairs, alterations and modifications.
ii. The FR 04-10816 requires a damage tolerance-based inspection program that addresses repairs made to aircraft structure and STCs that are susceptible to fatigue cracking that could contribute to catastrophic failure. The wording of FR 04-10816 and the AASFR published on February 2, 2005 are consistent.

b) Recommendations for Revisions to AC 91-56B:

The AAWG recommends that Draft AC 91-56B be revised as noted below. A copy of AC 91-56B with these changes annotated is contained in Appendix C.

i. Page 1, Paragraph 3. RELATED REGULATIONS AND DOCUMENTS.
   (1) Add subparagraph 3.a (4) add Parts 121.368, 121.370, and 121.370(a)
   (2) Add subparagraph 3.a (5) add Parts 121.16, 129.32, 129.33.
   (3) Add sub paragraph 3.b (4) add future AC 120-AAWG.

ii. Pages 4, 5. Paragraph 6.f. SUPPLEMENTAL STRUCTURAL INSPECTION PROGRAMS.
   (1) Page 4, Change first sentence to read, "The operators will be expected to accomplish a damage tolerance based inspection program of all alterations, modifications and repairs made to aircraft structure and STCs that is susceptible to fatigue cracking that could contribute to a catastrophic failure. This is to be done in accordance with the timelines established in the "Aging Airplane Safety" rule.
   (2) Page 5, Change the last sentence, last phrase to read, "... but the "Aging Airplane Safety" rule requires that all alterations, modifications and repairs made to aircraft structure and STCs that is susceptible to fatigue cracking that could contribute to catastrophic failure be considered."

iii. Page 5, Paragraph 7. MANDATORY MODIFICATION PROGRAM.
   (1) Add subparagraph 7.c. stating the "Aging Airplane Safety" rule requires that all modifications that are susceptible to fatigue cracking that could contribute to catastrophic failure be considered.

iv. Page 6, Paragraph 8 (c) CORROSION PREVENTION AND CONTROL PROGRAM (CPCP). Delete this subparagraph as the FAA has withdrawn rulemaking for the CPCP. Include a paragraph that stipulates industry standard practices.

v. APPENDIX 1, Page 1, Paragraph 1 (e).
   (1) Change the first two sentences to read, "The effect of repairs, alterations and modifications approved by the DAH and made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, should be considered. In addition it will be necessary to consider the effect of all repairs and operator or STC-approved alterations and modifications on individual airplanes, which are made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure."

vi. APPENDIX 1, Page 5, Paragraph 6. STRUCTURAL REPAIRS, ALTERATIONS AND MODIFICATIONS.
   (1) Change the first sentence in subparagraph 6.a. to read, "Operators are responsible for ensuring that an assessment is made of all repairs, alterations and modifications (e.g., STCs) to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, to develop a damage tolerance based inspection program that ensures the same confidence as the baseline structure."
   (2) Change the second sentence in subparagraph 6.b. to read, "Repairs, alterations and modifications made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, may invalidate these maintenance programs and would require additional analysis and/or testing."
   (3) Change subparagraph 6.c. to read, "Operators must accomplish a damage tolerance assessment for all new repairs, alterations and modifications to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure."

2) Task 1, Element 1 - Airplane Certification Level

ARAC was requested to examine the following:

The significance of the airplane certification amendment level in providing direction for the development of damage tolerance inspections and methods for repairs.

Airplane certification amendment level provides a number of directions for the development of damage tolerance inspections and methods for repairs. For example, no direction exists for damage tolerance for airplanes certified prior to 14 CFR 25 Amendment 45; in the case of an airplane certified to 14 CFR 25 Amendment 54 and beyond, directions exist.

For the purposes of compliance to the AASFR, a more important question requires answering; that being "what amendment level should a respective airplane be required to show compliance?" The AAWG has considered this issue and provides the following response:

a) AASFR Rule Requirements

14 CFR Parts 121.370a and 129.16 require that *"maintenance programs include damage-tolerance based inspections and procedures for airplane structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure The inspections and procedures must take into account the adverse effects repairs, alterations and modifications may have on fatigue cracking and the inspection of this airplane structure.*"

Alterations and modifications are discussed in Section 3 of this report. This section discusses repairs and repairs to alterations and modifications.

For new and existing repairs, Damage Tolerance Evaluations (DTE) must be accomplished for compliance to the AASFR. Basically, the amendment level of the 14 CFR 25.571 to be considered for this assessment may depend on the certification level of the airplane model, but also on the amendment level of the airworthiness requirements in force at the time of the assessment.

This section establishes the minimum amendment level to be considered for the Damage Tolerance (DT) justifications of repairs in the following categories:

- Existing repairs with an existing DT justification;
- Existing repairs without DT justification, that may require justification in the future;
- Future repairs that will require DT justification.

b) Chronology of 14 CFR 25.571

Table 2.1 summarizes the changes that have occurred to 14 CFR 25.571 and its predecessors since the introduction of commercial large transport category jet airplanes. Historically, the amendment level at time of certification determines the level of analysis required for the as delivered structure and any future repairs not considering the new requirements under 14 CFR 121.370a and 129.16.

TABLE 2.1 – CHRONOLOGY OF CHANGES TO 14 CFR 25.571

Date	Amendment Level	Change
Prior to 1965	CAR 4b – Fatigue Evaluation	Applicant had the option of certifying the structure either fail-safe or safe-life.
February 2, 1965	Conversion of CAR 4b to FAR25 - Fatigue Evaluation	Applicant had the option of certifying the structure either fail-safe or safe-life.
September 10, 1966	Amendment 25-10	Added requirement for sonic fatigue.
May 8, 1970	Amendment 25-23	Added dynamic effect factor of 1.15 on FS strength loads.
December 1, 1978	Amendment 25-45	Replaced the fail-safe requirement with a damage tolerance (fail-safe) requirement. Established inspections to be included in the maintenance manual required by 25.1529
October 14, 1980	Amendment 25-54	Established the Airworthiness Limitations Section of the Instructions for Continued Airworthiness
August 20, 1990	Amendment 25-72	Added PSD gust requirements, removed propellers from discrete source damage
March 11, 1996	Amendment 25-86	Revised gust loads
March 31, 1998	Amendment 25-96	Added requirement for 2-lifetime fatigue test for Widespread Fatigue Damage. Added requirement that inspection thresholds must be determined by crack growth for certain types of structure

The first obvious demarcation line as it relates to the AASFR is 14 CFR 25.571 Amendment 45. Aircraft certified after 14 CFR 25.571 Amendment 45 should theoretically have damage tolerance inspections in place for the type design. All repairs to these aircraft should have been evaluated from a damage tolerance viewpoint and any necessary inspections incorporated into the individual airplane maintenance program. However, industry accepted practices for airplanes certified to 14 CFR 25.571 Amendment 45 have not always provided damage tolerance data for repairs.

The damage tolerance standards established at Amendment 45 were not significantly revised until Amendment 96 which changed the way the inspection thresholds are to be determined:

> "*Inspection thresholds for [certain] 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."

14 CFR 25.571 Amdt 25-96 "Damage-tolerance and fatigue evaluation of structure" (1998).

As a result, airplanes certified to 14 CFR 25.571 Amendment 96, conventional 'fatigue' analysis for determination of threshold has been restricted for new certification programs in the USA. Other regulatory authorities have yet to codify a similar requirement.

Airplanes certified prior to Amendment 45 do not have damage tolerance based inspection programs unless they were added at a later time through the SSID and RAP programs.

c) Damage Tolerance Evaluation of Structural Repairs

For an aircraft structural repair, the current policy is:

"*The structure is then restored to the original certification status; either safe-life, fail-safe, or damage tolerant and approved in accordance with established procedures.*"

FAA Advisory Circular 25.1529-1 "Instructions for Continued Airworthiness of Structural Repairs on Transport Airplanes" (1991).

In other words, it must be ensured that damage tolerant structure will remain damage tolerant after it has been repaired. The damage tolerance justifications are performed according to the amendment level in force at the time of the original type certification.

Repairs made to Airplanes certified prior to Amendment 45 are not currently required to have damage tolerance justified repairs unless those repairs are made to structure that has been identified under AD mandated SSID programs or otherwise required by 14 CFR 121.370. Repairs to the SSID/P structures use 14 CFR 25.571 Amendment 45 as a basis for the determination of DT data.

d) Changed Product Rule

The basic policy may be modified by the 'Changed Product Rule (CPR)', which is intended to enhance safety through the incorporation of the latest amendments in the certification level of changed products:

"*An applicant for a change to a Type Certificate must show that the changed product complies with the 14 CFR 25 that are applicable to the changed product and that are in effect at the date of the application for the change.*"

14 CFR 21.101 "Designation of Applicable Requirements"

The CPR is applicable only to significant changes to products, and does not strictly apply to structural repairs unless the repair is done on structure certified using an amended certification level as determined by the CPR.

e) 14 CFR 25.571 Amendment Level For Compliance to the AASFR

Based on the discussions above and for the purposes of finding compliance to 14 CFR 121.370a/129.16, the AAWG recommends that the following basic policy be used for future damage tolerance evaluations for repairs:

TABLE 2.2 - 14 CFR 25.571 AMENDMENT LEVEL FOR COMPLIANCE TO THE AASFR

25.571 Airplane/STC Certification	25.571 Repair Certification
Pre Amendment 45	Amendment 45
Amendment 45, or later	Airplane/STC Certification Level

3) Task 1, Elements 2 and 3 - Effectiveness of SSID/P and ALS Programs to provide DT data for Repairs

ARAC was asked to consider the following two issues:

A. The degree to which Supplemental Structural Inspection Documents/ Programs (SSID/P) or equivalent documents/programs provide direction to repair the structure using damage-tolerance-rated repairs. The assessment should apply to SSID/Ps or equivalent documents/programs developed for 14 CFR part 25 pre-amendment 25–45 transport airplane models having a maximum gross takeoff weight of 75,000 lbs or greater. The following should be identified:

- ***Areas of aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by SSID/ Ps or equivalent documents/programs***
- ***Significant assumptions applied in developing SSID/Ps or equivalent documents/programs***
- ***Any significant issues in the implementation of the requirements of SSID/Ps or equivalent documents/programs***
- ***Data from SSID/Ps or equivalent documents/programs that would be useful in supporting this new tasking***

B. The degree to which an applicable airplane model's Airworthiness Limitations Section (ALS) provides direction to repair the structure using damage-tolerance-rated repairs. This assessment should apply to damage-tolerance-based inspection programs/ data developed for 14 CFR part 25 amendment 25–45 or later transport airplane models having a maximum gross takeoff weight of 75,000 lbs or greater. The following should be identified:

- ***Areas of aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by a damage-tolerance-based inspection program/data***

- ***Any significant issues in the implementation of the requirements of the damage-tolerance-based inspection programs/data***
- ***Data from the damage-tolerance based inspection programs that would be useful in supporting this new tasking***

The AAWG has examined these issues and responds with the following:

a) SSID/P and ALS Program Description

Supplemental Structural Inspection Documents/Programs (SSID/P) or equivalent documents/programs and the Airworthiness Limitations Section (ALS) of the Instructions for Continued Airworthiness provide inspections of Principal Structural Elements (PSEs) based on damage tolerance evaluations. Both the SSID/P and ALS were developed to support the continued airworthiness of airplanes. SSID/P programs are for airplanes certified prior to Amendment 45 of 14 CFR 25 and are based on the guidance given in AC 91-56A (Reference (2.g)). ALS programs have been developed for airplanes certified to Amendment 45 of 14 CFR 25 or later and are based on the guidance given in AC 25.571-1C and 14 CFR 25.1529.

The SSID/P and ALS were developed to define damage tolerance based inspections and are considered an acceptable means of compliance with the AASFR for the baseline structure. Further investigation must be done to determine fatigue critical structure so that that structure, when repaired, receives appropriate attention.

The SSID/P and ALS programs provide inspections on a limited number of structural areas of the airplane. The assumptions made in determining the areas to be inspected by OEMs contained in the SSID/P and ALS must be understood so that the determination of the fatigue critical structure required by §§ 121.370a and 129.16 is correct. It is likely that only the structure requiring supplemental inspection is included in the SSID/P and ALS documents. Structure that does not require supplemental inspection may also be classified as 'fatigue critical structure' since this structure's continued airworthiness is being controlled under a FAA approved normal maintenance program. Fatigue critical structure may require evaluation for supplemental inspections if repaired, altered or modified.

b) SSID/P or ALS Program Assumptions

In order for a SSID/P or ALS to be developed, a number of assumptions are required, including but not limited to:

i. Determination of PSEs,

ii. Stresses used for analysis,

iii. Airplane utilization,

iv. Size of initial flaws,

v. Probability of crack detection,

vi. Environment of the structure,

vii. Material properties and,

viii. Crack propagation methodology.

These assumptions are normally documented and approved by the FAA and provide a level of confidence in maintaining the continued airworthiness of the fleet. Any significant deviation from these assumptions can cause the effectiveness of the programs to change. Deviations include and are not limited to different airplane utilization, modifications and repairs.

Different airplane utilization may include length of flight, payload weight, cabin altitude, flight altitude, airplane retirement and predominant environment. Each of these could have a significant impact on the program. For example airplane retirements could impact the group of airplanes that are available for inspection in a program that samples the airplanes.

For those pre-amendment 45 airplanes, various manufacturers have produced and published SSID programs (See Reference (3.e)).

c) Normal Maintenance Issues

As previously discussed, normal maintenance is relied upon for a portion of the fatigue critical structure that does not require directed inspections. There were specific assumptions regarding normal maintenance contained in the SSID/P and ALS approvals. Those assumptions are relied upon to provide the necessary frequency and type of inspections to maintain continued airworthiness after the SSID/P or ALS threshold for a large portion of the fatigue critical structure. It is common practice within the industry to escalate maintenance intervals as experience with the airplane and its operational environment become better known. It is important for those entities seeking compliance to 14 CFR 121.370a/129.16 to understand those assumptions and make the appropriate adjustments to the normal maintenance program at the SSID/P or ALS threshold. Some ALS programs already require this adjustment.

d) Status of SSID/P and ALS Programs by Airplane Model

Table 2.3 summarizes the current status of all Airbus and Boeing SSID/P and ALS programs.

TABLE 2.3A – AIRPLANES WITH SSID AD DTA REQUIREMENTS FOR REPAIRS ALTERATIONS AND MODIFICATIONS

Airplane / AD Number	FAR 25/25.571 Amdt	DTA of New Repairs		DTA of Old Repairs	AC 25.1529-1 applies	AD addresses Alterations or Modifications
		Before SSID Program Threshold	After SSID Program Threshold			
727 (All) / 98-11-03 R1	CAR 4b/Pre FAR	Yes	Yes	At Threshold	Yes – except for AD	Yes
737 (100 & 200) / 98-11-04 R1	15/0	Yes	Yes	At Threshold	Yes – except for AD	Yes
737 – 300, 400, and 500 AD Pending	51/0	No at this time	Yes Fuselage / RAP	Yes Fuselage / RAP	AD will specify Compliance Requirements	N/A
747 (All) / 2004-07-22	39/0	No	Yes	At Threshold.	Yes – Initial approval “FAA” then final approval needs AMOC.	Yes – needs AMOC.
A300 (B2-1A, B2-1C, B2K-3C, B2-203 B4-2C, B4-103, & B4-203) / 96-13-11	20	Yes*	Yes*	N/A	Yes	N/A
DC-8 (All) 93-01-15	0/0	No	Yes only if per AD	Implied	No – needs AMOC or ACO approval	No
DC-9 (10 – 50) / 96-13-03	0/0	No	Yes only if per AD	At Nth	No – needs AMOC or ACO approval	No
DC-10 (All) / 95-23-09	22/10	No	Yes only if per AD paragraph	At Nth AD paragraph	No – needs AMOC or ACO approval AD paragraphs	No

Airplane / AD Number	**FAR 25/25.571 Amdt**	**DTA of New Repairs**		**DTA of Old Repairs**	**AC 25.1529-1 applies**	**AD addresses Alterations or Modifications**
		Before SSID Program Threshold	**After SSID Program Threshold**			
DC-9 (81, 82, 83, 87) & MD-88 / AD 2004-11-07	40/10	No	Yes AD paragraph	Yes AD paragraph	Yes AD paragraph (e) & Note 2. No AD paragraph	Yes AD paragraph

* RAS embodied after 1992

TABLE 2.3B – AIRPLANES WITH ALS DTA REQUIREMENTS FOR REPAIRS ALTERATIONS AND MODIFICATIONS

Airplane / AD Number	FAR 25/25.571 Amdt	DTA of Repairs	AC 25.1529-1 applies	AD addresses Alterations or Modifications
717 (200)	82/72	Yes	Yes	N/A
737- 600, 700, 800	Fuselage and empennage 77/0 Wing 77/72	Yes	AD will specify Compliance Requirements	N/A
737-700C, 900	91/86	Yes	Yes	N/A
757 L/N 1-764 / 2001-20-12	85/45	Yes	Yes	No
757 L/N 765 and beyond	85/45	Yes	Yes	N/A
767 L/N 1-668 / 2001-08-28	89/45	Yes	Yes	No
767 L/N 669 and beyond	89/45	Yes	Yes	N/A
777	(Series 200/300) 86/72 (Series 300ER) 98/96	Yes	Yes	N/A
A300 (600)	45/45	Yes*	Yes	N/A
A310	45/45	Yes*	Yes	N/A
A318	86/86	Yes	Yes	N/A
A319	86/86	Yes	Yes	N/A
A320	54/54	Yes*	Yes	N/A
A321	54/54	Yes	Yes	N/A

Airplane / AD Number	FAR 25/25.571 Amdt	DTA of Repairs	AC 25.1529-1 applies	AD addresses Alterations or Modifications
A330	72/72	Yes	Yes	N/A
A340	72/72	Yes	Yes	N/A
MD-10 (10F & 30F)	Structure not affected by change - Same as DC-10 Structure affected by change 89/86	No** AD Pending	Yes	N/A
MD-11 (All)	61/54	Yes	Yes	N/A
MD-90 (30) / 97-11-07	70/54	Yes	Yes	N/A

* RAS embodied after 1992

** AD will specify Compliance Requirements

e) Summary and AAWG Recommendations

i. Those areas of the fatigue critical structure that require supplemental inspections are listed in the SSID/ALS. Areas of the fatigue critical structure not listed in the SSID/ALS will require evaluation for supplemental inspections if repaired, altered or modified.

ii. If an operator has escalated his baseline maintenance structural task intervals, an adjustment to operator's baseline maintenance program may be necessary at SSID/P or ALS thresholds, depending on the assumptions used to establish the SSID/P and ALS.

iii. There is little consistency between the various SSID/P and ALS programs relative to how those programs provide direction to repair the structure using damage-tolerance-rated repairs. Further review has established that the AASFR will provide the means to provide consistency in the handling of repairs to SSID/P and ALS structure.

iv. The SSID/P and ALS programs were developed to address the un-repaired fatigue critical structure and do not consistently provide instructions for repairs to that structure. Therefore, the AAWG has concluded that there is no data from the SSID/P and ALS programs which are specifically useful in supporting the new tasking.

v. The AAWG recommends that the model-specific Compliance Documents described in proposed AC 120-AAWG contain a statement which confirms that the FAA-approved SSID/P or ALS for that airplane model is an acceptable means of compliance for the AASFR, for the baseline structure of that airplane model.

4) Task 1, Element 4 - Effectiveness of RAP Documents in providing DT data

ARAC was asked to consider the following concerning Repair Assessment Programs:

The degree to which existing Repair Assessment Guideline documents developed for §§ 121.370 and 129.32 provide damage-tolerance-based inspections for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The assessment should identify the following:

- ***Areas of the aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by these documents***
- ***Data from these documents that would be useful in supporting this new tasking***

The AAWG has considered this issue and provides the following response:

a) RAP Program Description

On December 9, 2002, a requirement for a Repair Assessment Program (RAP) (14 CFR 121.370 - Amdt. 121–295, 67 FR 72834) requiring DT data for repairs to the fuselage pressure boundary was introduced for 11 airplane types. These 11 types were all certified to pre-Amendment 45 to 14 CFR 25, including:

- Airbus A300
- BAC 1-11
- B707/720
- B727
- B737
- B747
- F-28
- L1011
- DC-8
- DC-9/MD-80
- DC-10

The RAP is a program that is limited to repairs of the fuselage-pressurized boundaries (fuselage skin, door skin and bulkhead webs). The programs were developed based on a series of studies conducted for the FAA by the Airworthiness Assurance Working Group (See Reference (3.a)). The study conducted two surveys of airplanes in 1992 and 1994 in which 1051 repairs installed on 65 airplanes of 9 different models were assessed. The major conclusions of the assessment were that

- 60% of the repairs would need damage tolerance evaluation,
- Majority of the repairs were on the fuselage (less than 10% on other structure),
- There were no immediate safety concerns, and
- Old aircraft had more repairs.

Based on these studies the AAWG concluded that repairs to the fuselage pressure boundary were of the highest priority for potential problems that could affect continued airworthiness.

Operators who have adopted an FAA approved assessment procedure in their maintenance programs are fully compliant with the requirements of the AASFR for the structure identified in the assessment programs. To be in compliance to AASFR, other components of the fuselage not covered would require FAA approved programs.

A model specific RAP document (Reference (3.d)) developed in accordance AC120-73 (Reference (2.i)) provides guidance to determine the inspection threshold, interval and method for each repair as required. Repairs that have been assessed according to these guidelines are in compliance with the requirements of the AASFR. Repairs that go beyond the scope of the RAP document or other approved data (such as SRM) may require additional regulatory approvals in defining the maintenance requirements for compliance to the AASFR.

b) ATA Assessment of AASIFR Impact to Industry

The ATA, in responding to the December 2002 publication that promulgated the Aging Airplane Safety Interim Final Rule (AASIFR), indicated that approximately 142,600 repairs (on Boeing Airplanes alone) and 3300 STCs would need to be assessed for damage tolerance under the requirements of the AASIFR (Reference (3.g)). There is a need to determine whether a RAP program generalized to all fatigue critical structure would be an effective means to support operator compliance as opposed to reviewing and providing DT data on an individual repair-by-repair basis.

The AAWG recommends that the technical and economic merits of a generalized RAP program for all fatigue critical structure be considered and developed if feasible. In all cases, the operator must have the necessary data to show compliance by December 18, 2009.

c) Requirements on Other Airplanes Not Affected By RAP

In regard to the fuselage pressure boundary, all other aircraft types / models are still required to comply with AASFR. Damage tolerance assessment methods and inspection procedures will need to be introduced for repairs accomplished on these aircraft.

d) AAWG Critique of the RAP Program

The consensus of the AAWG is that the development of the RAG documents for the Fuselage Pressure Boundary Repairs was vital for the implementation of this program. The success of the 14 CFR 121.370 program can be attributed to the cooperation of all segments of the industry including the FAA, operators and manufacturers.

Considering the newness of the program only very limited data is available that provides some insight as to the effectiveness of the RAG documents. Three operators were surveyed concerning how successful the RAG documents had been in assessing repairs to the fuselage pressure boundary. The application of these programs is limited to the older airplanes and there is only limited experience available. The results of this survey are encouraging in that the process assessed and provided DT data for a large percentage of the repairs. The Table 2.4 documents the results of the survey

TABLE 2.4 – SUMMARY OF RAG DOCUMENTS REPAIR CATEGORIZATIONS

Airline	Number of A/P	Average No of Repairs per A/P on the Fuselage Pressure Boundary	Percentage Successfully Assessed per A/P using RAG Documents
A	60	37	70%
B	48	71	91%
C	N/A	N/A	50%

The operators provided the OEMs with a critical review of the existing RAP documents developed for operator compliance to 14 CFR 121.370. It was pointed out that the operators were still relatively new to the document and that not many airplanes currently required assessment. The operators defined four main issues that they would like to be resolved for each of the two OEMs. The following summarizes their positions:

TABLE 2.5 – RAP PROGRAM IMPROVEMENTS

AIRBUS	BOEING
Provide Flexible Inspection Options	Automate the Process
Automated/Simplified Process	Provide Flexible Inspection Options
Improved navigation/document layout	Include Removed/Superceded SRM Repairs with DTA Information
Provide BZI/MPD Correlation	Provide BZI/MPD Correlation

The operators pointed out that by making these adjustments to the existing RAP, the OEM would effectively reduce the number of repairs that would require evaluation by the OEM or third party.

e) AAWG Conclusions and Recommendations

i. Fuselage RAP programs are successful

ii. The AAWG recommends that the technical and economic merits of a generalized RAP program for all fatigue critical structure should be considered and developed if feasible. In all cases, the operator must have the necessary data to show compliance by December 18, 2009.

iii. For those airplanes certified to Amendment 45 or later where repairs to the fuselage pressure boundary were not provided with DT data, it is recommended that a Fuselage RAP program be developed in accordance with the guidance provided in AC 120-73.

5) Task 1, Element 5 - Comparison of Approaches used to require DT data for repairs in SSID/P areas.

ARAC was asked to consider the following:

Identify the issues/difficulties industry has encountered with establishing damage-tolerance-based inspections and procedures for repairs as required by various FAA approaches in issuing SSIP airworthiness directives (e.g., 727/737 AD 98–11–03 R1, AD 98– 11–04 R1 verses other SSIP AD approaches like the 747). The assessment should identify the following:

- ***Comparison of approaches with pros and cons for each approach***
- ***Data from these documents that would be useful in supporting this new tasking***

The AAWG has considered this issue and provides the following response:

The various approaches adopted in the promulgation of the SSID ADs will have no effect on compliance requirements of the AASFR. The approach of the 727 and 737 SSID ADs relative to existing repairs are, in practice, very similar to the approach outlined in proposed AC 120-AAWG. With regard to the approach the FAA chose to take on the 747 SSID, the AAWG determined that no useful guidance was given with respect to the requirements for DTA on repairs. In effect the AD only addresses inspectability issues with repairs that would hinder SSID inspections.

6) Task 1, Element 6 - Effectiveness of SRMs in providing DT data

ARAC was asked to consider the following:

The extent to which Structural Repair Manuals (SRM) provide damage-tolerance-based inspections for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

The AAWG has considered this issue and provides the following response:

The inclusion of DT based inspections in Structural Repair Manuals (SRMs) is based on the certification amendment level of the airplane or otherwise required by rules such as 14 CFR 121.370 or ADs that mandate programs like the SSID. Repairs to airplanes certified prior to 14 CFR 25 Amendment 45 have not been assessed for damage tolerance. However, all repairs contained in the SRMs for airplanes certified to 14 CFR 25 Amendment 45 or later are generally designed to be damage tolerant. SRMs for these airplanes, may or may not document DT based inspections. For repairs that are in the SRM and do not have DT based inspections documented, safety is ensured, in part, by the normal maintenance programs supplemented by inspections required by either the SSID or ALS. With the requirements of 14 CFR 121.370a and 129.16, each of the Model Specific SRMs will need to be reviewed and updated to include DT inspections, if needed, for all repairs to fatigue critical structure. Tables 2.6 through 2.8 document the current status of SRMs for certain large category airplanes subject to the AASFR.

TABLE 2.6 - AIRBUS SRM AND INDIVIDUAL REPAIR DT STATUS

Airplane Model	***FAR 25.571 Cert. Level***	***Current SRM Repairs***	***New Incorporated SRM Repairs***	***SRM DT Fully Compliant[3]***	***Individual Repairs DT Status***		
					OLD	CURRENT	FUTURE
A300	25-10	DT[1]	DT	2008	Since 92[2]	DT	DT
A300-600	25-45	DT[1]	DT	2008	Since 92[2]	DT	DT
A310	25-45	DT[1]	DT	2008	Since 92[2]	DT	DT
A 318	25-86	DT[1]	DT	2008	DT	DT	DT
A 319	25-86	DT[1]	DT	2008	DT	DT	DT
A 320	25-54	DT[1]	DT	2008	Since 92[2]	DT	DT
A 321	25-54	DT[1]	DT	2008	DT	DT	DT
A330	25-72	DT	DT	Today	DT	DT	DT
A340	25-72	DT	DT	Today	DT	DT	DT

1. All repairs Damage Tolerant, Some repairs may lack specific DT based maintenance inspection requirements
2. Covered by AIRBUS Repair Design Approval Sheet
3. SRM contains DT based maintenance inspection requirements for all repairs

TABLE 2.7 - BOEING SRM AND INDIVIDUAL REPAIR DT STATUS

Airplane Model	***FAR 25.571 Cert. Level***	***Current SRM Repairs***	***New Incorporated SRM Repairs***	***SRM DT Fully Compliant[6]***	***Individual Repairs DT Status***		
					OLD	CURRENT	FUTURE
B 707	CAR 4b	No	No	?	DT[5]	DT[5]	2010
B 727	CAR 4b	DT[5]	DT[5]	2009	DT[5]	DT[5]	2010
B 737 CL	Amdt 0[1]	DT[5]	DT[5]	2009	DT[5]	DT[5]	2010
B 737-600/-700/-800 Fuselage and Empennage	Amdt 0	DT[5]	DT[5]	2009	DT[5]	DT[5]	2010
B 737-600/-700/-800 Wing	Amdt 72	DT	DT	2009	DT[4]	DT[4]	DT[4]
B 737-700C/-900	Amdt 86	DT[5]	DT	2009	DT[4]	DT[4]	DT[4]
B 747	Amdt 0[2]	DT[5]	DT[5]	2009	DT[5]	DT[5]	2010
B 757	Amdt 45	DT[5]	DT	2009	DT[4]	DT[4]	DT[4]
B 767	Amdt 45	DT[5]	DT	2009	DT[4]	DT[4]	DT[4]
B 777	Amdt 72[3]	DT	DT	At TC	DT[4]	DT[4]	DT[4]
DC-8	CAR 4b	DT[5]	DT[5]	2009	DT[5]	DT[5]	2010
DC-9	CAR 4b	DT[5]	DT[5]	2009	DT[5]	DT[5]	2010
DC-10	Amdt 10	DT[5]	DT[5]	2009	DT[5]	DT[5]	2010
MD-80	Amdt 10	DT[5]	DT[5]	2009	DT[5]	DT[5]	2010
MD 11	Amdt 54	DT	DT	At TC	DT[4]	DT[4]	DT[4]
MD-90	Amdt 54	DT	DT	At TC	DT[4]	DT[4]	DT[4]
B 717	Amdt 72	DT	DT	At TC	DT[4]	DT[4]	DT[4]

1. Strut on 737-300/-400/-500 DT Cert level is Amdt 45
2. Strut on L/N 1047 and on DT Cert level is Amdt 45
3. 300ER DT Cert level is Amdt 96 (has equivalent safety finding for WFD
4. May be limited to assessment of a threshold where supplemental inspections are required.
5. All repairs Damage Tolerant, Some repairs may lack specific DT based maintenance inspection requirements
6. SRM contains DT based maintenance inspection requirements for all repairs

TABLE 2.8 - OTHER MANUFACTURERS SRM AND SB DT STATUS

Airplane Model	***25.571 Cert. Level***	***Baseline Structure***	***SRM Status***	***SBs DT Fully Compliant***
SAAB 340/2000	Post 54	Cert Level- ALS	DT rated	DT rated
CL-600	Post 45	Cert Level - ALS	DT rated	DT rated
CASA CN-235	*	*	*	*
DHC-8	Post 54	Cert Level	DT rated	DT rated
DHC-7	Pre-45	Mini SSIP- AD Issued	Not DT rated	Not DT rated
DO 328-100/300	Post 54	Cert Level	DT rated	DT rated
ATR 42/72	54	Cert Level - ALS	DT rated	DT rated
EMB 135/145	Post 54	Cert Level - ALS	DT rated	DT rated
BAE146-100/200	45	Cert Level	Not DT rated	Not DT rated
BAE146 AVRO & -300	54	Cert Level	Not DT rated	Not DT rated
F-27 Basic	Pre 45	SSID	Not DT Rated	Not DT Rated
F-28 Basic	Pre 45	SSID	DT Pressure Boundary	DT Pressure Boundary
Fokker 50/70/100	Post 54	Cert Level -ALS	DT Rated	DT Rated
CV [3]580STC/[3]640STC	Pre 45	No SSID	Not DT rated	Not DT rated
BAE Jetstream-4100	Post 54	Status is pending	Status is pending	Status is pending
Lockheed L-1011	25-10	*	*	*
Lockheed L-188	*	*	*	*
Lockheed L-382	*	*	*	*
EMB 120	Pre 54	Cert Level-ALS	DT Rated	DT Rated

* Information was requested but not received from the DAH

7) Task 1, Element 7 - The need to require DT data in TC and STC Holder Issued Service Bulletins

ARAC was asked to consider the following:

Assess the need to include damage-tolerance-based inspections and procedures in TC and STC Holder issued Service Bulletins (SB) that provide repair instructions for aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

The AAWG has considered this issue and provides the following response:

The requirement for inclusion of DT data in service bulletins is driven by the certification level of the airplane and in some cases, the amended certification level as established by an Airworthiness Directive. With some exceptions, airplanes certified to Amendment 45 of 14 CFR Part 25 (or higher) require Service Bulletin modifications to primary structure to have DT data included within the SB instructions. The AASFR will place further requirements to have SBs that are damage tolerant for all areas of fatigue critical structure. With the requirements of 14 CFR 121.370a and 129.16, each of the Model Specific SBs will need to be reviewed and DT data provided for repairs to fatigue critical structure. Table 2.9 and 2.10 documents industry status on Service Bulletin information. Note: Some manufacturers information is contained in Table 2.8.

TABLE 2.9 - SB DT STATUS AIRBUS

Airplane Model	25.571 Cert. Level	Current SBs [3]	New SBs [3]	SBs DT Fully Compliant
A300	25-20	DT	DT	As part of life extension[1]
A300-600	25-45	DT	DT	From TC[2]
A310	25-45	DT	DT	From TC[2]
A 318	25-86	DT	DT	From TC
A 319	25-86	DT	DT	From TC
A 320	25-54	DT	DT	From TC[2]
A 321	25-54	DT	DT	From TC
A330	25-72	DT	DT	From TC
A340	25-72	DT	DT	From TC

NOTES:
1. Mod. Since SSID, repairs after life extension
2. Mod. Since TC, repairs after life extension
3. SB review necessary during life extension exercise

TABLE 2.10 - SB DT STATUS BOEING

Airplane Model	25.571 Cert Level	Current SB[5]	New SB[5]	SB DT Fully Compliant
B 707	CAR 4b	No	Partially DT	?
B 727	CAR 4b	Partially DT	Partially DT	2009[4]
B 737 CL	Amdt 0[1]	Partially DT	Partially DT	2009[4]
B 737-600/-700/-800 Fuselage and Empennage	Amdt 0	Partially DT	Partially DT	2009[4]
B 737-600/-700/-800 Wing	Amdt 72	DT	DT	2009[4]
B 737-700C/-900	Amdt 86	DT	DT	2009[4]
B 747	Amdt 0[2]	Partially DT	Partially DT	2009[4]
B 757	Amdt 45	Partially DT	DT	2009[4]
B 767	Amdt 45	Partially DT	DT	2009[4]
B 777	Amdt 72[3]	DT	DT	At Cert
DC-8	CAR 4b	Partially DT	Partially DT	2009
DC-9	CAR 4b	Partially DT	Partially DT	2009
DC-10	Amdt 10	Partially DT	Partially DT	2009
MD-80	Amdt 10	Partially DT	Partially DT	2009
MD 11	Amdt 54	DT	DT	At TC
MD-90	Amdt 54	DT	DT	At TC
B 717	Amdt 72	DT	DT	At TC

NOTES:
1. Strut on 737-300/-400/-500 DT Cert level is Amdt 45
2. Strut on L/N 1047 and on DT Cert level is Amdt 45
3. 300ER DT Cert level is Amdt 96 (has equivalent safety finding for WFD)
4. SBs or document containing DT data for each SB
5. All Service Bulletins will need a review no matter what the certification level is.

C. Discussion of AC

1) Method of Approach – DAH Compliance Document and Operator Implementation Plan

a) Why the AAWG chose to utilize an ACO approved data package (DAH Compliance Document)

In developing an approach that would facilitate the operators' timely compliance with the AASFR with respect to repairs, the AAWG determined that it would be necessary for operators to have access to an ACO approved data package containing the DT data required for compliance. This data package, termed "Compliance Document", would contain a listing of available DT data, developed by a DAH, and a means to obtain FAA Approved DT data, for unique repairs. The compliance document would be submitted to the FAA ACO for approval. This process is similar in principle to that conducted by Type Certificate Holders in support of operator compliance with the § 121.370 Repair Assessment Rule.

The compliance documentation developed by the DAH and approved by the ACO would encompass all fatigue critical structure, including repairs and repairs to Repairs, Alterations, and Modifications (RAM) as necessary, and should include implementation schedule information. The listing of available DT data and the means to obtain data for unique repairs should provide the data necessary to support an operator's development of an Implementation Plan. An ACO approved Compliance Document will facilitate the operators' ability to identify and incorporate into their maintenance program the DT data necessary to support compliance with §§ 121.370a and 129.16.

b) Why the AAWG Chose to Utilize a PMI Approved Operator Implementation Plan

In addition to the need for operators to have access to ACO approved data packages (Compliance Documents), the AAWG also recognized the need for an Implementation Plan for operators to incorporate DT data from the Compliance Documents into the existing maintenance program. The incorporation of an Implementation Plan into a certificate holder's FAA-approved maintenance program is subject to approval by the certificate holder's Principal Maintenance Inspector (PMI) or other airworthiness inspector responsible for oversight of an operator.

2) DAH/Operator Work Split – Expected STG Activities

The Structures Task Group (STG) process as defined in Reference 3.i has been used successfully to implement aging airplane recommendations to model specific airplanes. These model-specific STGs will be used to support compliance with 14 CFR Parts 121.370a and 129.16. The model specific STG process should be initiated by the DAH well in advance so that Compliance Document will be available in time to facilitate the development of a Implementation Plan by individual operators. In order to initiate the STG process, the DAH will need to prepare some preliminary data for the STG to consider, including:

- Identify the airplane model(s) or airplane serial numbers that the DT data will be applicable to.

- Identify the fatigue critical structure.
- Identify the certification level.
- Identify existing DT data that supports compliance.
- Propose DT data that would need to be developed to support compliance.

The results of these preliminary tasks should be presented to the STG for discussion and agreement. This analysis should contain the rationale of the approach envisaged by the DAH to support compliance with §§ 121.370a and 129.16. It should clearly identify those existing DT data that already supports compliance (e.g. SRMs, RAGs, SBs, ADs), and where additional DT data should be developed. The results of these analyses will be part of the compliance document. The approach to develop these data should be presented, discussed and agreed as part of the STG.

The extent to which RAGs will be developed to cover the fatigue critical structure (versus case by case DTEs) should be addressed. Service feedback, presented by the operators, would be useful to support this discussion. How operators will be informed of the SRM updates and changes should be also discussed as part of the STG.

An implementation schedule for the development of DT data should be proposed by the DAH and agreed by the STG.

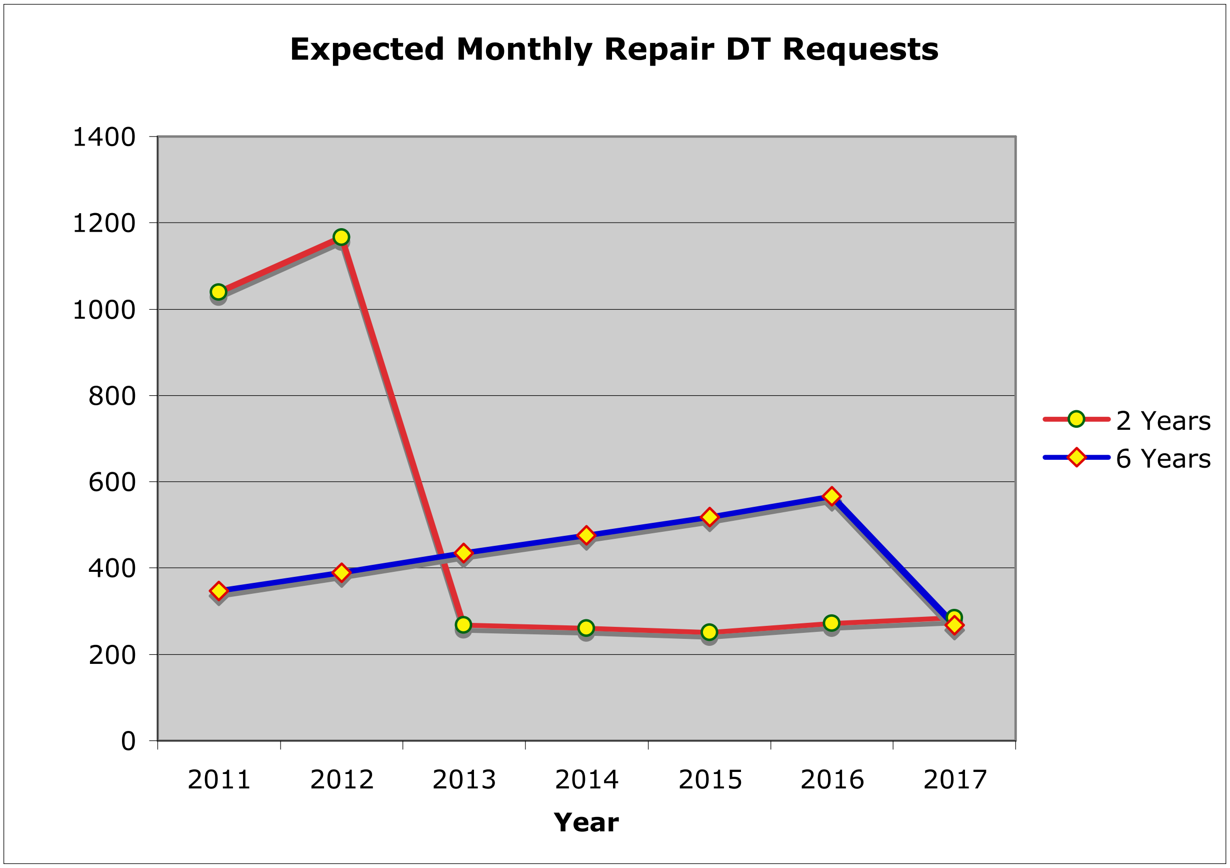
3) Implementation Schedule and Approach

a) Implementation Schedule

In the preamble to the AASFR, the FAA has established that the Repair Assessment Program (RAP) required under 14 CFR 121.370 is an accepted means of compliance for the AASFR for the fuselage pressure boundary. The preamble for the AASFR further states that the FAA expects the new repair assessment guidelines will be consistent with those developed for 14 CFR 121.370. Therefore, the requirements for developing and accomplishing damage tolerance inspections for repairs should not be more restrictive than the requirements for repairs on the pressure boundary, as required by 14 CFR 121.370.

The implementation schedule and approach outlined in AC 120-AAWG, for existing repairs, is patterned after the Repair Assessment Process given in AC 120-73, “Damage Tolerance Assessment of Repairs to Pressurized Fuselages”. However, the AAWG has made a determination that the implementation program described in AC 120-73 most likely would not be able to be supported by the industry. The main reason is that a significant number of airplanes would be beyond the flight cycle DSG on December 20, 2010. This would create a situation where neither the operators, DAHs nor FAA could support the necessary surveys, data development requirements and maintenance program updates because of resource demands created by the expected volume of requests for the damage tolerance requirements for repairs (See Figure 2.1). If the AC 120-73 guidance (next C-check after effective date of the rule for airplanes beyond DSG) is used, the AAWG has estimated that over 750 airplanes (based on US Registered Airplanes active January 1, 2005) would require surveys within two years after December 20, 2010. It is estimated that this could create a backlog of as many as 37,500 repairs per year that requiring DT data whereas only 4500 repairs per year are estimated after the second year of the program. This would create an undue hardship for the industry and may in fact divert resources necessary for the continued airworthiness of aging fleets, resulting in decreased safety.

Figure 2.1 – Implementation Comparison AC 120-73 Versus AAWG Proposed Approach



The AAWG reviewed the data and has proposed a modified approach based on AC 120-73.

i. For airplanes below DSG on December 18, 2009, the proposal is to use the guidance provided by AC 120-73.

ii. For airplanes beyond DSG on December 18, 2009, it is recommended that airplanes are survey on a prorated basis within the established D-check time frame as defined by the Model Specific Structures Task Group. The purpose of prorating is to address the issues above and therefore the operators cannot be allowed to defer the implementation of the program until the end of the D-check time period. For example, if an operator had 30 airplanes over DSG on December 18, 2009 and was operating on a six year D-check equivalent, he would be required to inspect approximately 5 equivalent airplanes each year* until all of the airplanes were inducted into the program (*accounting for normal variations allowed by his Operation Specification). He should not be allowed to defer the required surveys until the end of the D-check or equivalent time period.

The AAWG, in making this recommendation, understands that it represents a change in the way past repair programs have been implemented. As the AAWG studied this issue they recognized that many factors supported an adjustment to the implementation approach. First, it is recognized that the Damage Tolerance Evaluation establishes a supplemental inspection program. That program supplements inspections that are already occurring by virtue of both normal and mandated maintenance programs, such as:

- Instructions for continued airworthiness
- Scheduled maintenance Programs
- SSIDs
- RAP
- Service Bulletins
- Corrosion Prevention and Control Programs

These programs have been effective in detecting repairs that require replacement because of detectable damage.

Second, programs such as the SSID and RAP were developed before a significant number of airplanes were subject to the regulations and therefore provided the industry a means to implement the rules. Those rules also were designed to address repairs that were the most significant to continued airworthiness (fuselage pressure boundary). Pre amendment 45 airplanes are under the requirements of §121.370 that requires operators to incorporate Repair Assessment Guidelines into their maintenance program for repairs to the fuselage pressure boundary. The recommended change in implementation does not affect the implementation program for repairs to the fuselage pressure boundary and only extends to repairs to other fatigue critical structure. For those airplanes certified to Amendment 45 or later, there are a certain number of airplanes that did not receive repairs with damage tolerance data for a period of time. The AAWG has recommended that a RAP type program be developed for the fuselage boundary repairs of those airplanes developed in accordance with AC 120-73. Those programs should be available to the operators on December 18, 2009.

b) Implementation Thresholds Based on DSG

Both AC 120-73 and the proposed AC 120-AAWG provide guidance material which establish the implementation times for accomplishing the repair assessment process as a percentage of the Design Service Goal (DSG) for an aircraft model. The DSG is defined as the period of time (in flight cycles/hours) established at design and/or certification during which the principal structure will be reasonably free from significant cracking. During the development of the Repair Assessment Program for pressurized fuselages, the STG's utilized this guidance to determine the implementation thresholds in flight-cycles that are contained in 121.370. A similar approach should be used for the development of the model-specific Compliance Documents; however, it should be noted that for certain portions of the fatigue critical structure, the rate of crack growth may be governed by flight hours rather than flight cycles. Therefore, these portions of the fatigue critical structure may have a separate implementation threshold given in flight hours.

c) Maintenance program escalation

The rule requires that operators incorporate the damage tolerance inspections and procedures into their maintenance program for all affected aircraft by December 20, 2010. In establishing a DT program, an operator may determine that the existing structural inspection program for a portion of the fatigue critical structure is sufficient to meet damage tolerance inspection requirements for repairs in that area. In this case, if an operator subsequently escalates the structural inspection program based on reliability data, it is the operator's responsibility to ensure that the new inspection interval is sufficient to meet damage tolerance inspection requirements for repairs in that area, or to establish a separate DT inspection task for those repairs. The FAA should ensure that PMIs, who are responsible for operator oversight of maintenance requirements, are aware of the requirements to review repair categories when escalations are requested.

4) Discussion on Adopted "DT" Phrases/Terminology used in the Rule and AC and what it means.

The Rule and AC uses several phrases to define various elements of Damage Tolerance. The purpose of these terms is to distinguish the different elements. There are four different terms used.

- Damage Tolerance Inspections and Procedures
- Damage Tolerance Data (DT data)
- Damage Tolerance Inspections (DTI)
- Damage Tolerance Evaluation Processes (DTE)

The term Damage Tolerance Inspections and Procedures is used in the 14 CFR 121.370a/129.16 rule language. This term is synonymous with the term Damage Tolerance Data (DT data) used extensively in the Advisory Circular.

Damage Tolerance Evaluation (DTE) refers to the process adopted as a means to develop Damage Tolerance Inspections (DTI). A DTE process could entail anything from a rigorous analysis methodology for use by a structures analyst to operator instructions that enable a survey and assessment of existing repairs to be made in a timely manner. And finally Damage Tolerance Data (DT data) refers collectively to the DTE processes and the DTI needed by an operator to address repairs as required by 14 CFR 121.370a/129.16.

5) Disposition and Recommendation Concerning AC 25.1529-1

a) Recommendations regarding the disposition of AC 25.1529-1

The AAWG recommends that AC 25.1529-1 be cancelled and the principal guidance be adopted into the proposed AC 120-AAWG. This proposal is made for two reasons. First, the guidance developed for AC 25.1529-1 uses language that is not uniformly applied and could be confusing. Second, AC 120-AAWG has been developed as the centerpiece for assessment of repairs on airplanes and all guidance material that is relevant should be contained in that document.

b) Three stage approach

Proposed AC 120-AAWG includes a three-stage procedure to gain approval of DT data for repairs. This is different than the two-stage approach contained in AC 25.1529-1. Industry practice, accepted by the FAA and EASA, currently allows a three-stage approach for development and approval of repair data. The three stages can be classified as:

1. Static Strength Approval and return to service
2. Establishment of threshold for inspection within twelve months of return to service
3. Establishment of repeat interval and inspection methodology, where necessary, before the threshold is reached.

The first stage is approval of the static strength data and the schedule for submittal of the DT data. Approval of the static strength component of the repair is required prior to return to service of the airplane. The schedule for the submittal of the damage tolerance data should be no later than 12 months following returned to service of the airplane.

The second stage of the process is the submittal and approval of the DT data that was scheduled in Stage 1. This data might only contain the threshold where inspections are required to begin. If this is the case, the submittal and approval of the remaining DT data may be deferred to the third stage. The operator should have a process in place to ensure that the remaining DT data is obtained and incorporated into his maintenance program before the established threshold.

The third stage is approval of any DT data not submitted in the second stage (typically repeat interval and inspection methodology). This data would need to be submitted and approved prior to the inspection threshold being reached. This would typically involve the inspection method and the repeat intervals.

c) Expectations concerning the control of DTI data within an operators maintenance program

Control of data within an operators maintenance program is crucial to maintaining the airworthiness of the airplane. Data to support a particular repair needs to be identified, tracked, and recorded to ensure proper accomplishment of the data requirements.

Operators are expected to have in place a Quality Control process to ensure proper application of approved data in the repair of an airplane.

i How is the data controlled

Operators are required by 14 CFR 121 to have a method to control data within their organizations. This method supports the requirements for return to service of an airplane after a repair. Included in these procedures are a means to provide detailed instructions to mechanics to perform the repair, track a repair, and schedule for inspection and re-inspection, if required.

(1) The operator should have a process that provides and controls the flow of data to ensure that accurate information is being supplied to mechanics performing the repair, that the data submitted for approval accurately depicts the repair, and a process to track the data when approved to ensure proper actions are taken such as inspections or replacements.

(2) The operator should have a process such as the continuing analysis and surveillance program to ensure that the repair data is being applied as approved, the person applying the repair is properly trained and qualified, and proper data and equipment are available to perform the repair. The quality control function would also ensure that after the repair is accomplished that it was done in accordance with the data that was approved for the repair. If inspections and repeat inspection are required, the quality control function would ensure that proper techniques are applied during the inspection and that if discrepancies are noted they are recorded for corrective action.

ii Tracking Process

A tracking process should be in place that would allow data developed for a repair to be distinguishable and identifiable as to the airplane applicability, techniques to be used, materials needed for the repair, and recording requirements to ensure retention of data.

iii Task card revision and control

If a repair requires inspections or repeat inspections, the operator should have a process in place to develop repair documentation to record these inspections. This documentation may take the form of task cards that contain inspection criteria along with methods and equipment needed. It could take the form of a stand-alone engineering order or repair authorization that would contain similar information. The process should also have a method for maintaining the information on the documentation in a current state. If data approval changes inspection criteria, a revision process should be in place to acknowledge that change and revise the document to reflect the change.

6) Relationship between AC 91-56B, AC 120-73, AC 25.1529-1 and AC 120-AAWG

Several ACs provide guidance in establishing Damage Tolerance based maintenance programs for large transport category airplanes. The proposed AC for this tasking is yet another piece of guidance material that gives guidance on this subject. Whereas previous ACs provided guidance on specific issues, the proposed AC from this tasking utilizes and extends the concepts of the previous ACs for the purpose of establishing airplane level maintenance programs that are based on Damage Tolerance.

Three other ACs were previously published that provide information on Damage Tolerance Based Maintenance Programs.

AC 25.1529-1 – Provides guidance on the means by which repairs to SSID/P PSEs are evaluated for damage tolerance to allow a rapid return to service. This AC was written before the industry had developed an extensive expertise in performing damage tolerance assessments. The AAWG is recommending that this AC be cancelled and incorporated in part into AC 120-AAWG as an Appendix with significant changes.

AC 91-56B – Provides information on Aging Airplane Programs and specific guidance on the development of SSID/P programs. The AAWG has offered the FAA some recommendations on proposed changes to this AC under Paragraph 2.B.1 of this report. This AC is still valid and should be consulted for the development of new SSID/P programs. SSID/P programs develop damage tolerance based maintenance programs for the baseline as delivered primary structure of the airplane and can be used to show compliance to 14 CFR 121.370a/129.16.

AC 120-73 – Provide guidance on development of Repair Assessment Programs (RAP) for the Pressurized Fuselage Boundary. This AC was developed for the industry as a means to show compliance to 14 CFR 121.370, for eleven models of airplanes certified prior to Amendment 45 of 14 CFR 25. This AC is still valid and should be consulted for guidance on developing new RAP programs for any airplane. A RAP program developed under this AC can be used to show compliance to 14 CFR 121.370a/129.16 for the fuselage pressure boundary.

3. Task 2 – Evaluation of Alterations and Modifications for Damage Tolerance

A. Task 2 - Element 1 – Recommendations for Damage Tolerance Based Inspections of Alterations and Modifications

The AAWG was asked to review and comment on:

Prepare a written report assessing how an operator would include damage tolerance-based inspections and procedures for alterations and modifications made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure….

1) Introduction

For the purposes of the proposed AC and this report, the term "alteration" is used to describe a design change and encompasses the term "modification".

There are three categories of alterations that may be installed on a transport category airplane:

a) Supplemental Type Certificates (STCs) – these alterations are normally developed by persons other than the Type Certificate Holder (TCH). They are approved by the FAA under Subpart E of 14 CFR 21.

b) TCH alterations – these are alterations that are developed and approved by the TCH, either through an Amended Type Certificate approved by the FAA under Subpart I of 14 CFR 21, or through FAA-approved service documents such as Service Bulletins.

c) Individual alterations – these are alterations that are developed by and for an operator, which are approved through individual FAA Forms 8110-3 or other means acceptable to the Administrator.

The approach for damage tolerance-based inspections and procedures for alterations will be different for these three categories of alterations.

2) Types of Alterations to be Considered

Any alteration that directly affects the baseline fatigue critical structure must be evaluated regardless of the size or complexity of the alteration. This includes such alterations as SBs produced by the TCH and individual alterations for which an operator obtains FAA approval. The damage tolerance evaluation of an alteration must include both an evaluation of the newly created fatigue critical structure (i.e., does the alteration create new structure susceptible to fatigue cracking which could contribute to a catastrophic failure), and the interaction effects between the altered structure and the baseline fatigue critical structure. These interaction effects may not be limited to the area immediately surrounding the alteration; for instance, an alteration that includes a gross weight increase may significantly affect the magnitude and distribution of external loads on fuselage, wing, empennage, control surfaces, and landing gear structure.

Model Specific Airplane STG should establish a list of STC alterations that could be embodied on fatigue critical structure that should be considered on a model specific basis. The STG should consider the following list as examples of such alterations:

a) Passenger-to-freighter conversions (including addition of main deck cargo doors).
b) Gross weight increases (increased operating weights, increased zero fuel weights, increased landing weights, and increased maximum takeoff weights).
c) Installation of fuselage cutouts (passenger entry doors, emergency exit doors or crew escape hatches, fuselage access doors, and cabin window relocations).
d) Complete re-engine or pylon alterations.
e) Engine hush-kits and nacelle alterations.
f) Wing alterations such as installing winglets or changes in flight control settings (flap droop), and alteration of wing trailing edge structure.
g) Modified skin splices.
h) Any alteration that affects several stringer or frame bays.
i) An alteration that covers structure requiring periodic inspection by the operator's maintenance program.
j) An alteration that results in a change to the operational mission; e.g. significantly changes the manufacturer's load or stress spectrum (passenger-to-freighter conversion).
k) An alteration 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.

3) DAH and STG Activity

The AAWG recommends that the model-specific STG identify any STCs, which may be incorporated on a significant number of airplanes represented by the STG members. If such STCs are identified, the STG should invite the DAH for those STCs to attend and make presentations on the identified STCs and the status of any DT data for those STCs.

Chapter 2.C.2) of this Report describes the data which the DAH will need to provide to an STG to support the development of DT data for repairs. The same basic data will be necessary to support the development of DT data for alterations.

4) Operator/DAH Communication

For STC or TCH alterations, operators will need to contact the DAHs to determine if DT data exists for those alterations. There are three scenarios which are expected to occur:

a) The DAH No Longer Exists. In some cases, the STC may have been surrendered to the FAA.

b) The DAH Exists But Is Unable Or Unwilling To Develop The Data. An STC holder may not have the resources available to develop the data, or may be unwilling to commit the resources to do so. (Note: The FAA noticed (Reference 3.h) their intent to publish a new Subpart to 14 CFR 25 which would require DAHs to make DT data available to operators to support compliance with the AASFR. If this rule were promulgated, then this scenario would force the DAH to make a decision to either develop the data or to surrender the STC to the FAA.)

c) The DAH Exists And Provides The DT Data.

5) Recommended Timeline for Compliance

a) STCs

The AAWG has reviewed the various FAA regulations (SSID ADs) with respect to compliance requirements and timelines for development of DT data for STCs. Based upon that review; the following situations have been identified and need the development of specific timelines.

i) The DAH has developed DT data.
ii) The DAH has not developed DT data, and they will develop the data.
iii) The DAH has not developed the DT data, and they will not or cannot develop the data.

b) Alterations developed by a TCH

Alterations developed by a TCH may affect fatigue critical structure. The TCH should provide DT data for their alterations by December 18, 2009 in order to support operator compliance with the AASFR. The AAWG recommends that a standardized screening process for alteration SBs should be developed to identify which alteration SBs are affected by the AASFR.

c) Individual Alterations to fatigue critical structure

Individual alterations to fatigue critical structure are typically smaller in size, and the interaction effects are similar to those for a repair. An example of such an alteration may be an antenna that was installed and subsequently removed by a previous operator, but the structural reinforcement doubler was retained or a doubler similar to an SRM repair was installed. Such an alteration may have also been accomplished without issuing a formal STC or the records may be incomplete or missing. This scenario is most likely to occur on older, pre-amendment 45 airplanes and on alterations which were developed prior to the Changed Product Rule (14 CFR 21.101).

With respect to these type individual alterations to fatigue critical structures, the AAWG proposes to address them in the same manner as repairs for that model airplane. Therefore, they should be identified, assessed and categorized using the process given in the model-specific Compliance Document for repairs.

Figure 3.1 – Recommended Actions for Developing DT Data for STCs

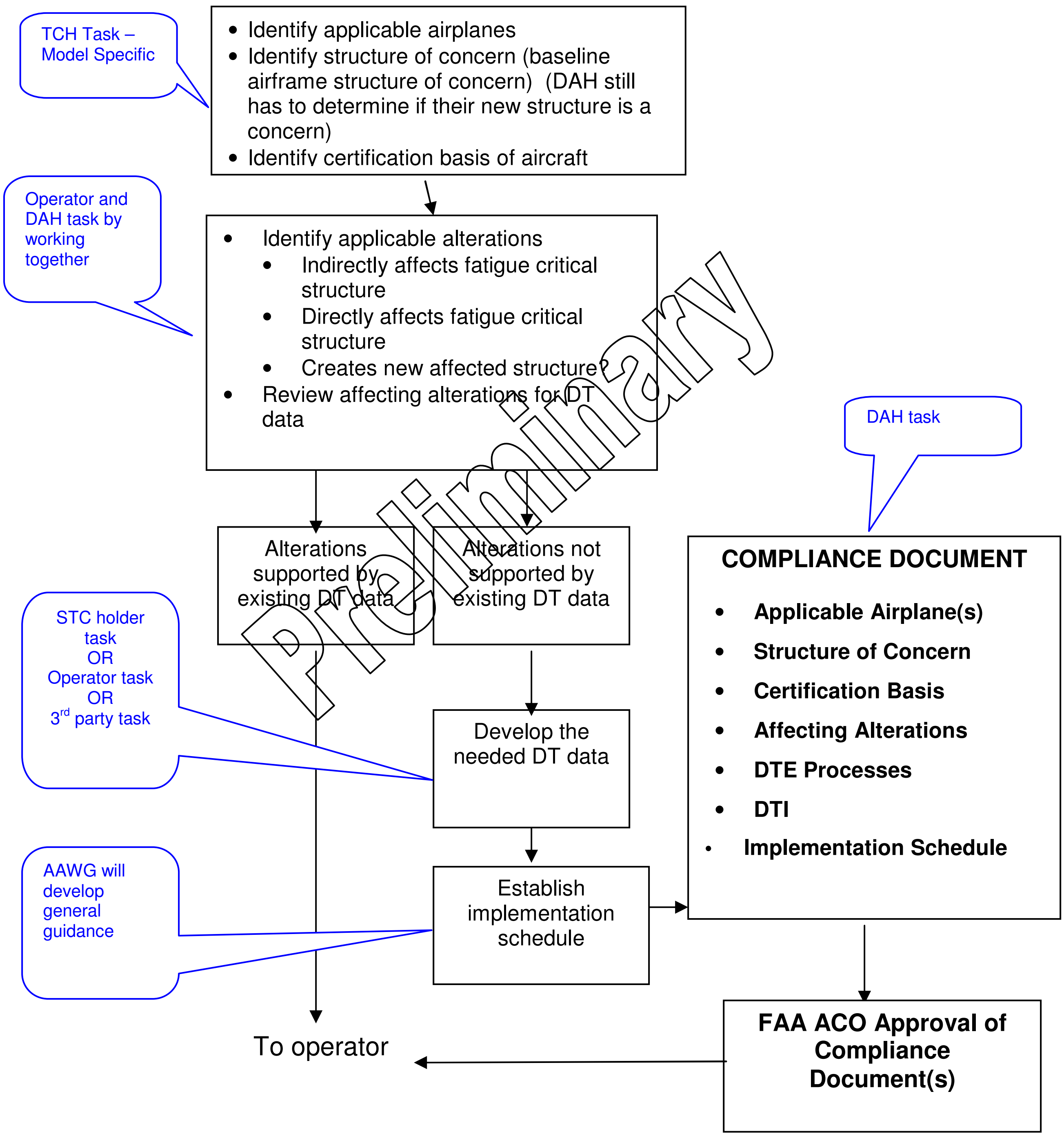
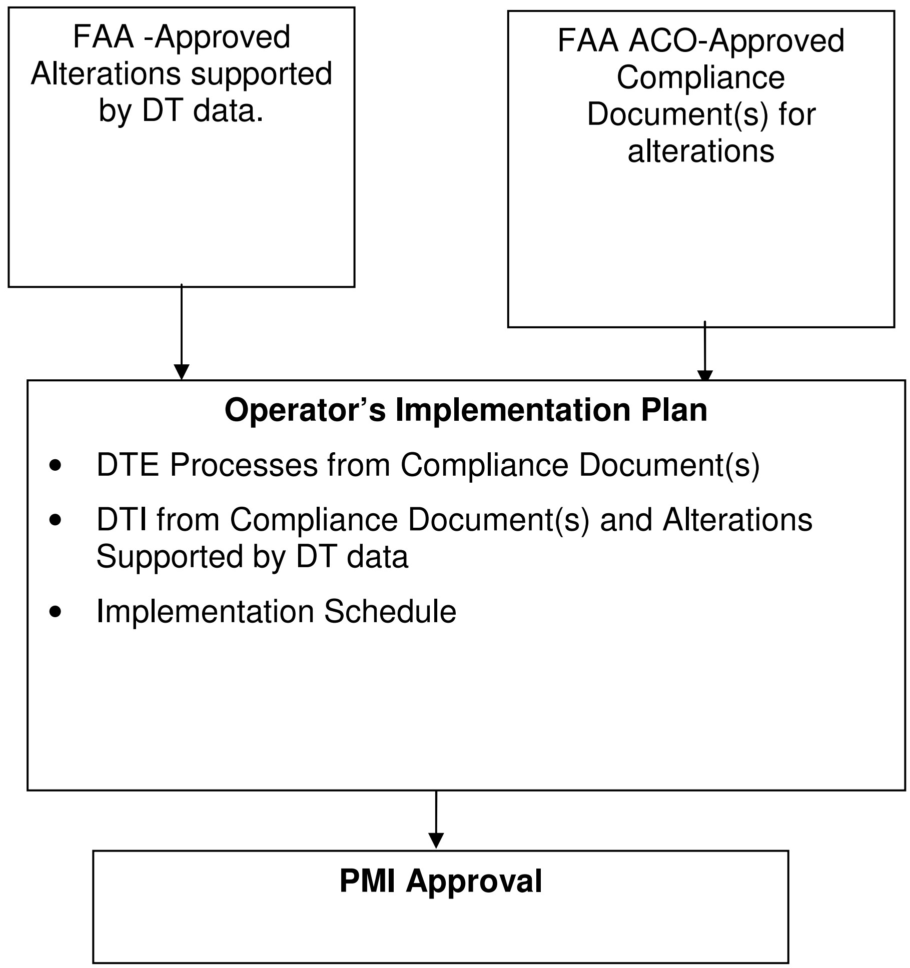


Figure 3.2 - Recommended Operator Action to Incorporate DT Data



B. Task 2 - Element 2 – Evaluation of Task 1 Recommendations on Repairs to Alterations

The AAWG was asked to review and comment on the following:

The report should also provide a recommendation on the means of compliance provided by the AC developed in Task 1 in regards to repairs installed on STC or ATC approved alterations and modifications.

This task element is interpreted by the AAWG to mean:

- Document the means of compliance developed for repairs to alterations in Task1.
- Determine if that means of compliance is applicable to alterations
- Document the AAWG's expectations for the STC DAHs.
- Propose changes to the AC as required.

The proposed AC 120-AAWG is intended to address all repairs to aircraft, including repairs to alterations and modifications. The proposed AC recommends that the DAH for the alteration develop a Compliance Document for repairs to the altered structure; the guidance is contained in Chapter 2 of the AC. The Compliance Document for repairs to the altered structure should contain:

- The applicability (airplane model(s), model variations, or serial numbers) of the alteration.
- An identification of fatigue critical structure that is unique to the alteration.
- The 14 CFR 25.571 certification level to be used.
- A review of existing DT data, if any.
- Development of additional DT data to support compliance. This could either take the form of RAGs or instructions to perform DTE on a case-by-case basis.
- An implementation schedule to bring existing repairs up to DT standards.
- FAA ACO approval of the Compliance Document for the alteration (by the FAA ACO having cognizance over the DAH).

The AAWG believes that the proposed AC 120-AAWG contains sufficient guidance for DAHs of alterations to develop a Compliance Document which would support operator compliance with the AASFR for repairs. As stated in Element 1 of Task 2, the STGs should identify DAHs that hold STC data that are of general interest to a Model Specific STG. The AAWG expects DAHs of such STCs to participate in the STG process and to advise the STG of the status of DT data, both for the STC itself and for repairs to the STC fatigue critical structure. The FAA has publicly noticed (Reference (3.h)) the fact that they are considering the issuing a rule to require DAHs to make available the necessary DT data in a timely fashion, to support operator compliance with the AASFR.

C. Task 2 - Element 3 – Evaluation of the Effectiveness of AC 91-56B for Alterations

The AAWG was requested to review the Draft AC 91-56B and assess its ability to provide the necessary guidance for an entity that is seeking compliance to 14 CFR 121.370a/129.16. In Task 2, the Tasking requests ARAC to do the following for alterations and modifications:

The ARAC should assess the effectiveness of AC 91–56B to provide guidance to STC holders for developing damage-tolerance-based inspections and procedures for alterations and modifications. The ARAC should do the following:

- ***Assess the effectiveness of AC 91– 56B to support Industry compliance with the AASIFR with respect to alterations and modifications.***
- ***Document any improvements to the AC that would provide better direction with respect to the guidance for STC holders in their development of damage-tolerance-based inspections and procedures for alterations and modifications.***

In Task 1, the ARAC was also requested to assess the effectiveness of AC 91-56B to provide guidance for an STC holder in seeking compliance with 14 CFR 121.370a/129.16 for repairs, and provide recommended changes. As stated in Section 3.B.1) of this Report where the topic for repairs was discussed, the overall findings and recommendations were the same for both alterations and modifications.

1) Discussion of Findings

In its review of Draft AC 91-56B, the AAWG made a determination that the guidance provided did not provide adequate directions for an entity seeking compliance to 14 CFR 121.370a/129.16. The changes incorporated into Draft AC 91-56B did not address a variety of technical and programmatic issues that an entity would need to address for compliance to the rule. The results of trying to follow the Draft AC would most likely resulted in a varying degree of compliance throughout the industry. In addition, there were significant differences between the Draft AC and the new FAA tasking contained in Federal Register Document 04-10816, dated 05-13-04. While the AAWG determined that Draft AC 91-56B would not be effective, it did view AC 91-56 as a top-level roadmap to the aging airplane programs that briefly describes the various programs and points to other ACs that provide specific guidance for each of the respective aging airplane programs. Therefore, in response to this the AAWG has developed a Draft AC 120-AAWG that provides guidance to both the DAH and the operator on an acceptable means of compliance to 14 CFR 121.370a/129.16.

2) Discussion of Proposed Changes to Draft AC 91-56B

On the basis of the above findings for Task 2, the AAWG also recommended changes to AC 91-56B with respect to alterations and modifications. These changes associated with Task 2 were included in Section 3.B.1) and Appendix C of this Report to avoid duplication or confusion.

D. Task 2 - Element 4 – Action Plan

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.

1) Action Plan: Task 2 Guidance Material

a) The AAWG will prepare and submit guidance materials for consideration of alterations and modifications to the TAEIG within six months of TAEIG acceptance of the written report.

b) Upon TAEIG acceptance of the AAWG guidance material, the AAWG will recommend that Model Specific STGs invite STC DAH and involve them in the dialog to ensure that DT data is in existence on December 18, 2009 for all commonly embodied STCs.

2) Action Plan: Proposed Schedule for Completion of Guidance Material

a) AAWG complete Task 2 report and submit to TAEIG by December, 2005

b) The TCH will form Model Specific STGs where there is a significant need (e.g. Airplanes certified prior to 14 CFR 25, Amdt 54) by January 2006 to address Task 4 and begin the development of Model Specific Compliance Documents.

c) AAWG will review the Task 2 report recommendations and complete action with appropriate AC 120-AAWG changes within six months of TAEIG Task 2 report acceptance.

d) AAWG will submit the amended guidance material for TAEIG approval at the next scheduled TAEIG meeting.

e) Following TAEIG Acceptance of the guidance material and at the next meeting of the STG, the STGs should identify specific STC DAHs that hold STCs on the Model under consideration.

f) TCH, working with their STGs will identify a list of fatigue critical structure ASAP.

g) The FAA is considering the publication of Subpart I with requirements for STC DAHs to provide DT data. Based on the EAPAS NPRM it is anticipated that Subpart I will require the submittal of a compliance plan by the DAH. That compliance plan will require a time schedule of activities to insure that the required data is supplied on time.

h) According to the FAA Schedule for Subpart I, STC DAHs will be required to submit the compliance plan within 90 days of the effective date of the final rule. At this point it will be apparent which STC DAHs will be providing DT data for the STCs they own.

i) DAHs should complete DT data for STCs, ATCs, SBs, etc. by December 2009. This date may change dependant upon the FAA's rulemaking for a Part 25 rule to require DT data.

j) Operators to incorporate DT data for STCs, ATCs, SBs, etc. by December 20, 2010, if available

k) Operators to submit plan to obtain FAA approved DT data for STCs, ATCs, SBs, etc. which have no DT data to cognizant PMI as part of the implementation plan submitted for compliance to 14 CFR 121.370a/129.16.

4. Task 3 – WFD Considerations for RAMs

A. AAWG Position Regarding the Assessment of WFD for Repairs, Alterations and Modifications:

The analysis of a RAM for WFD provides additional needed information concerning the maintenance program requirements to maintain the continued airworthiness of the airplane. Specifically it will either validate the inspection program established for fatigue related cracking or it would provide inspections that are more stringent and/or establish a removal limit for the RAM.

As part of a WFD evaluation, it was determined that the following two categories of RAMs should be addressed: RAMs susceptible to WFD; and RAMs to areas where the baseline structure is susceptible to WFD. For the latter category, a WFD evaluation is carried out for the baseline structure to establish the appropriate maintenance actions. A RAM in this area may have a repercussion on these maintenance actions. For instance, an STC may affect the stress level on a lap joint, and invalidate the maintenance actions that have been defined to preclude WFD in this lap joint. Therefore, WFD actions for baseline structure should be defined prior to requiring an assessment of the effect of the RAM.

B. Task 3 - Element 1 – Recommendations for WFD of RAMs

The AAWG was asked to consider the following in regards to WFD of RAMs:

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.

1) 2001 ARAC Recommendations Regarding WFD

In May 2001, ARAC recommended (See Reference (3.b)) that large transport category airplanes have new operational rules enacted that would assure that fatigue cracking that could lead to a WFD condition would be detected and corrected in a timely fashion. Two operating requirements were proposed by ARAC for each operational rule part. The first established a "Limit of Validity" of the maintenance program and the second established a requirement for structural maintenance programs that considered the aspect of preventing WFD in the fleet. In the near future, it is expected that the FAA will release these operational rules with some modifications based on the requirements of the AASFR and other rules that are currently being considered.

Appendix C contains a copy of the NPRM submitted by ARAC on the subject of WFD. For the purposes of reference, the following is a synopsis of the intent of the proposed operational rules.

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.

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 Final 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.

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 DAH.

Second, 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.*

2) Discussion of ARAC Recommendations

The ARAC recommendations for prevention of WFD were developed using the concept of a stand-alone audit of the baseline structure and any repairs, alterations and modifications that might have been performed. With the advent of the Aging Airplane Safety Final Rule in February 2005, the ARAC recommendations, while still being valid, need some reconsideration from both a technical and a managerial point of view. In addition, airplanes certified to later amendment levels of 14 CFR 25 may meet the WFD requirements during certification. With this in mind, the AAWG would like to extend and adjust the 2001 recommendations accordingly.

The 2001 ARAC recommendations stipulated a rather elaborate operator based means to develop and incorporate inspections into maintenance programs for WFD considerations for RAMs. The AAWG has reviewed this means and has determined that the AASFR provides a more convenient means of accomplishing the development of maintenance programs for RAMs that will preclude the development of WFD.

Specifically the determination of any maintenance actions required to preclude WFD should be done in context of the procedure established in the AC for determination of the damage tolerance requirements for the RAM. Such requirements are determined during Stage 3 of the review process for repairs. This is a natural place to determine all future maintenance requirements for the RAM including WFD. In the context of the AC, this procedure supports both new and existing RAMs.

For new RAMs, additional work is required on the part of the DAH. The DAH should consider updating any significant published documents like the SRM, RAP and or Structurally Significant Service Bulletins to include information relative to maintenance requirements for WFD.

Finally, the 2001 ARAC recommendations also recommended the establishment of a Limit of Validity (LOV). This LOV establishes a point in the operational life of the airplane where the maintenance program as contained in the ICA of the airplane for continued airworthiness is no longer supported by existing OEM engineering data. The ARAC recommends that operation of the airplane be halted at this point until new engineering data is developed to support the continued airworthiness. The LOV is applicable to both the baseline structure and any RAMs that may have been embodied.

a) 2005 AAWG Recommendations on WFD

The AAWG was specifically tasked to consider how best to assess the WFD characteristics of RAMs on the continued airworthiness of airplanes with a maximum gross takeoff weight of greater than 75,000 pounds. This includes all large transport category airplanes in service today.

The AAWG's original recommendations came with guidance information that allowed operation of the airplane up to DSG before a WFD assessment of the baseline structure was required for the airplane. This recommendation was written primarily for airplanes certified to 14 CFR Amendment 45 and earlier yet the AAWG believes that this is also appropriate for all post amendment 45 airplanes where a two-lifetime fatigue test was performed. The question is when is it appropriate to assess RAMs for WFD. The AAWG considered this question and determined that in all cases, assessment of a RAM for WFD should be done after the assessment of the baseline structure especially if the RAM was evaluated for Damage Tolerance and is under a continued airworthiness program. With respect to WFD for RAMs, the AAWG believes the following to be an appropriate program to enact:

- For those airplanes that need a survey to address DT for repairs, the WFD assessment should occur at the same timeframe (action and implementation plan)
- For newer airplanes that only need WFD for repairs (e.g. 14 CFR Part 25 Amdt. 54 and beyond), the WFD action should occur when the airplane reaches DSG
- For newer airplanes that only require WFD for alterations (e.g. 14 CFR Part 25 Amdt. 96 and beyond) the WFD action should occur at RAM certification

Further, the 2001 Recommendations failed to establish a means to implement the program. While all of the requirements were there, the mechanics of what needed to be done was lacking. Therefore, the AAWG believes that the following is appropriate to insure the timely handling of the WFD issues for both the baseline structure and any embodied RAMs. The actions discussed below should be in place and scheduled for completion for all affected airplanes by December 2010.

The AAWG envisions that the requirement will be addressed through the submittal of a plan by December 2009 that delineates the following DAH actions as developed within the STG activities:

i. Definition of the LOV for All Large Transport Category Airplanes with Maximum Gross Takeoff Weights greater than 75,000 pounds.

  (1) DSG, or
  (2) Other limit with rationale and/or a list of required actions (existing or underdevelopment)

ii. A schedule, dependent on 14 CFR 25 Certification Amendment as discussed above, for completion of the following:

  (1) A review of Published Service Information (SRMs, SBs, Service Letters, etc.) with-respect-to WFD and propose service action to achieve the initial LOV, if required.
  (2) Guidelines for determining which repairs and alterations need to be assessed for WFD.
  (3) Model specific implementation program, including:
    (a) Timeframe and actions required for when to review repairs and RAMs for WFD.
    (b) - STCs/ATCs are assessed for WFD (includes Baseline Structure of the STC/ATC and surrounding fatigue critical structure).

iii. Expected Timeframe for action would be in accordance with the 14 CFR 25 Amendment Level of the airplane under consideration as Depicted in the Table 4.1.

TABLE 4.1 – WFD REQUIREMENT BY CERTIFICATION LEVEL

	14 CFR 25 / 25.571 Applicable Amendment			
ISSUE	**Pre Amdt 45**	**Amdt 45**	**Amdt 54 to 86**	**Amdt 96**
Establishment of LOV	Dec 2009	Dec 2009	Dec 2009	Dec 2009
WFD Baseline	121.WFD	121.WFD	121.WFD	T.C.
DT RAMs-AASFR	Survey*	Survey* & T.C.	Survey* and/or T.C.**	T.C.
WFD RAMs	Concurrent with DT Survey*	Concurrent with DT Survey*	Survey Similar to one like the DT req.	T.C.

* Survey means Survey conducted per the AASFR Implementation Plan
** STG will decide if Survey is necessary

Note: Once the Limit of Validity is reached, the airplane can no longer be operated unless that original Limit of Validity is extended with appropriate new service actions.

This plan would be submitted to the ACO for approval.

The Table 4.2 further explains when a repair or alteration would receive an assessment for WFD. The information contained in this chart is preliminary and subject to further discussion and may differ in the final proposal developed in the Task 3 follow-on activity.

TABLE 4.2 – PROPOSED TIMELINE FOR DEVELOPING DT AND WFD MAINTENANCE REQUIREMENTS

Timelines for Obtaining DT and WFD Assessments for Repairs and Alterations				
		REPAIRS	**ALTERATIONS**	
DT	**Existing**	75% DSG*	By Dec 18, 2009 (if DAH support) OR plan in place to get data or other action within 4 yrs from Dec 18, 2009 (if no DAH support)	
	New	3 stage**	New cert. new instl	DT required prior to certification today (Recommendation)
			Old cert. new instl	DT required on all installations after Dec 20, 2010
WFD	**Existing**	75% DSG*	By Dec 18, 2009 (if DAH support) OR plan in place to get data or other action within 4 yrs from Dec 18, 2009 (if no DAH support)***	
	New Cert prior to Amend 45	3 Stage** Accomplished at time of DT assessment clear repair to operational limit	3 stage** Accomplished at time of DT assessment clear alteration to operational limit	
	New Cert Amend 45 to 95	At DSG 3 Stage **	At DSG 3 Stage ** Operators concerned that this may require a tracking or survey of their airplanes at DSG Airbus concerned that the requirement for WFD does not exist for these airplanes and that the baseline structure has not yet been evaluated for WFD, why consider repairs and alterations	
	New Cert At Amend 96 and Above	3 Stage** Accomplished at time of DT assessment clear repair to operational limit	3 Stage** Accomplished at time of DT assessment clear alteration to operational limit	

*75% DSG really means ….. Stage 1 @ 75% DSG
Stage 2 within 12 months from stage 1
Stage 3 just prior to (I)
Refer to App. 5 for details

**3 stage means what App. 4 says…. Stage 1 @ time of installation
Stage 2 within 12 months (DT, not WFD?)
Stage 3 just prior to (I), included DT & WFD

*** Requirement is to identify any maintenance actions required for WFD to DSG or LOV

b) Technical Considerations

The AAWG still supports the technical recommendations given to ARAC and the FAA in May 2001. This includes the establishment of a Basis for the Structure Maintenance Program and a definition of a "Limit of Validity" (LOV) or equivalent. The AAWG also supports a timely audit of the baseline structure and any repairs, alterations and modifications to define any required changes or additions to the structural maintenance program to preclude the occurrence of WFD.

While ARAC spent a considerable amount of time developing and confirming the WFD methodology for the baseline structure, comparably little time was spent on how that methodology would perform on repairs, alterations and modifications. It is now apparent that some further technical considerations with appropriate guidance need to be developed to prevent development of WFD in RAMs.

To facilitate the development of the data necessary for compliance to the rule, the following needs to be established:

i. Repair configurations that are susceptible to WFD
    (1) Size effect
        e.g. large doubler repairs (bigger than 1 frame bay two stringer bays)
    (2) Multiple site
        Repairs at the same location at multiple parts (e.g. stringers at the same frame station)
    (3) Interaction of different repairs
        Blend out near a doubler repair (stress increase due to two different reasons)

ii. Development of maintenance program parameters.

A major difference between RAMs and baseline structure is the level of associated test evidence. Whereas the baseline structure is almost fully represented in full-scale tests, RAMs may only be installed in selected areas. As a result, RAMs are typically justified by analysis methods that have been proven by tests rather than tests themselves. Guidance material is needed on how to adjust the factors associated to the determination of the Inspection Start Point (ISP) and the Structural Modification Point (SMP) to account for the lack of test evidence.

Further, a number of methods of analysis proposed for WFD account for the number of airplanes in the fleet in the determination of ISP and SMP. RAMs on the other hand may be unique to one airplane, or a limited number of airplanes making the use of fleet data difficult. Further the time those RAMs were embodied on an airplane would vary and their respective lives would likewise be difficult to characterize. Guidance is needed on how to appropriately handle such situations.

c) Program Management Considerations

i. Both new and existing RAMs should be assessed for WFD in the same time stipulated in the AC for DT. This means the three stage approach:

(1) Stage 1 – Clearance for Static Strength and return to flight
(2) Stage 2 – Within twelve months the establishment of a threshold for inspections
(3) Stage 3 – Twenty-four months before the threshold development of inspections and/or replacement times to maintain continued airworthiness when fatigue cracking is likely. Stage 3 contains consideration for development of WFD.

ii. Existing DAH documents, like the SRM and RAP, should be updated to include consideration for WFD damage scenarios by December 18, 2009 to support compliance to 121.WFD where operation past DSG is defined.

iii. The entities that are responsible for the development of data to support the three stage approach is as follows:

(1) Baseline structure to be supported by the OEM
(2) STCs to be supported by the STC holder
(3) RAMs done by a DAH to be supported by the DAH
(4) Where the DAH or STC holder no longer is in a position to support the development of the data, the certificate holder is responsible for the development.
(5) The time WFD should be assessed: Guidance should be developed that specify that WFD inspections should be incorporated into the maintenance planning beyond DSG at the threshold determined in Stage 2.

C. AAWG Recommendations

1) WFD for baseline structure should be accomplished prior to WFD for RAMS
2) With respect to WFD for RAMs
 a) For those airplanes that need a survey to address DT for repairs, the WFD actions should occur at the same timeframe (action and implementation plan)
 b) For those newer airplanes that only need WFD for repairs (e.g. part 54-96), the WFD action should occur at a timeline dependent upon when the airplane reaches DSG
 c) For those newer airplanes that only require WFD for alterations (e.g. Amdt. 54-96) the WFD action should occur at DSO.

3) Both new and existing RAMs should be assessed for WFD in the same time stipulated in the AC for DT. This means the three stage approach:
 a) Stage 1 – Clearance for static strength and return to flight
 b) Stage 2 – Within twelve months the establishment of a threshold for inspections
 c) Stage 3 – Twenty-four months before the threshold development of inspections and/or replacement times to maintain continued airworthiness when fatigue cracking is likely. Stage 3 contains consideration for development of WFD.

4) Existing DAH documents, like the SRM and RAP, should be updated to include consideration for WFD damage scenarios by December 18, 2009 to support compliance to 121.WFD where operation past DSG is defined.

5) The entities that are responsible for the development of data to support the three stage approach is as follows:
 a) Baseline structure to be supported by the OEM
 b) STCs to be supported by the STC holder
 c) RAMs done by a DAH to be supported by the DAH
 d) Where the DAH or STC holder no longer is in a position to support the development of the data, the certificate holder is responsible for the development.

To facilitate the development of the data necessary for compliance to the rule, the following should be established:

 e) Repair configurations that are susceptible to WFD
  i. Size effect
   e.g. large doubler repairs (bigger than 1 frame bay two stringer bays)
  ii. Multiple site

Repairs at the same location at multiple parts (e.g. stringers at the same frame station)

iii. Interaction of different repairs
Blend out near a doubler repair (stress increase due to two different reasons)

6) Development of WFD data.

A major difference between RAMs and baseline structure is the level of associated test evidence. Whereas the baseline structure is almost fully represented in full-scale tests, RAMs may only be installed in selected areas. As a result, RAMs are typically justified with analysis methods that have been proven by tests rather than tests themselves. Guidance material is needed on how to adjust the factors associated to the determination of ISP and SMP to account for the lack of test evidence.

Further, a number of methods of analysis proposed for WFD take into account the number of airplanes in the fleet in the determination of ISP and SMP because the details under examination exist on every airplane in that fleet. RAMs on the other hand may be unique to one airplane or a limited number of airplanes and may have significantly different lives than the airplanes themselves. Guidance is needed on how to appropriately handle such situations.

7) The time WFD should be assessed:

Guidance should be developed to specify that WFD inspections should be incorporated into the maintenance planning beyond DSG at the threshold determined in Stage 2.

D. Task 3 - Element 2 – WFD Action Plan

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.

1) Action Plan: Task 3 Guidance Material

Upon acceptance by ARAC of the recommendations above, the AAWG will establish a group of technical experts that will develop the required technical basis for the guidance material. They will then develop that material for inclusion in either FAA Advisory Circular 120-AAWG or another, yet to be determined, AC.

It is important that the guidance material will enable the STGs and individual operators to develop the required data to support operator compliance. The following is appropriate to consider when looking at both the guidance material and the operation of the STGs.

a) Screening process to identify significant STCs. The guidance material should contain a means to screen STCs to determine which ones would be of a potential concern for development of WFD.
b) Developing means to acquire data for significant STCs where the DAHs are not in a position to supply the data. There will be some STCs where the DAH is unavailable to develop the data. The STG should develop a plan whereby the data is developed.
c) There may be other actions that could be considered to assist the operators in developing the data.

2) Action Plan: Proposed Schedule for Completion of Guidance Material

The AAWG will complete this additional work within six months of the acceptance of the recommendations by ARAC.

A key element of the schedule is the inclusion of an invitation to significant STC holders to participate in the STG. An invitation should be extended to those DAHs who hold the certification data for STCs identified in step one. Their participation in the STG will be of great assistance in developing the required data.

5. Task 4 – Model Specific Programs

The DAH should complete the framework of a Compliance Document by December 20, 2008 for each affected model and that document should include the identification of fatigue critical structure and the means by which repairs are to be addressed (both existing and future repairs). This document will have within it the methods to be employed in the assessment but may not contain some of the required data such as updates to the SRM and any model specific RAGs. The SRM updates and any model specific RAG documents should be published by December 18, 2009. Once the SRM updates and any RAG documents are published and referenced in the Compliance Document, this document will be presented to the FAA ACO for approval. Following approval, the Compliance Document will form the basis for certificate holder compliance for repairs to the as delivered OEM structure to 14 CFR 121.370a/129.16.

6. Conclusions and Recommendations

Compliance with the new Aging Airplane Safety Final Rule, 14 CFR 121.370a and 129.16 will require operators and DAHs to cooperatively develop data that, in some cases, does not currently exist. The AAWG recommends that this be accomplished through model specific STGs for both baseline structure as well as for repairs, alterations and modifications. Operators of applicable airplanes must have this data to show compliance by December 20, 2010. To this end, all updates to existing data should be published by December 18, 2009.

Task 1 & 2 Conclusions and Recommendations (Repairs and Alterations/Modifications)

Even though 14 CFR 121.370a and 129.16 could be construed to be applicable to repairs alterations and modifications to composite structure, the AAWG did not specifically develop guidelines for this particular type of structure. There were three principal reasons for this: (1) there is not a significant amount of composite primary structure on airplanes today; (2) most of that structure is on airplanes that were certified to Amendment 45 or later; and (3) the certification process in regards to damage tolerance for composite structure is significantly different than that of metallic structure and are adequately covered by AC 20-107A.

The AAWG developed draft AC 120-AAWG to document the process for assessing repairs to fatigue critical structure. The proposed AC addresses repairs to both baseline structure as well as repairs to alteration and modifications. The AAWG believes that the proposed AC 120-AAWG contains sufficient guidance for DAHs to develop a Compliance Document which would support operator compliance with the AASFR for repairs.

Key to completing this process is the identification of fatigue critical structure for each applicable airplane model. Repairs to the fatigue critical structure will need to be assessed for damage tolerance. Depending on the certification level of the aircraft model and whether installed repairs are already covered by DT data, this may require a survey of the aircraft.

The conclusions and recommendations (***Bold Italicized Text***) from the AAWG tasking regarding repairs and repairs to alterations are documented in Sections 3 through 5 of this report. These are summarized below.

1. SSID programs and ALS were developed to address the un-repaired fatigue critical structure and do not consistently provide instructions for repairs to that structure.

2. The AAWG recommends that existing SBs, SRM, SSID programs and ALS programs for each applicable airplane be reviewed and updated to include DT data for all repairs to fatigue critical baseline structure as well as repairs to alterations and modifications by December 18, 2009.

3. The AAWG concluded that there are repairs and modifications to structural components susceptible to fatigue contained in the AMM and/or CMM and that these repairs and modifications are not under the same level of scrutiny that other repairs are subjected to.

4. The AAWG recommends that the FAA issue additional tasking to the ARAC to investigate the status of the AMM and CMM, and make appropriate recommendations.

5. The AAWG concluded that the development of RAG documents for the fuselage pressure boundary (fuselage skin, door skins, and bulkhead webs) provides vital information for operators to comply with 14 CFR 121.370 and 129.32 for the applicable airplanes.

6. The AAWG recommends that a generalized RAP program (includes greater coverage of fatigue critical structure than the pressurized boundaries) be considered and developed, if technically and economically feasible.

7. For those airplanes certified to Amendment 45 or later, where repairs to the fuselage pressure boundary were not provided with DT data, it is recommended that a Fuselage RAP program be developed in accordance with the guidance provided in AC 120-73, where economically feasible.

8. The AAWG recommends that the TAEIG task the AAWG to revise AC 120-AAWG to include a process for developing damage tolerance based maintenance inspections for alterations and modifications. A copy of the proposed tasking is included in Appendix E of this report.

9. The AAWG reviewed draft AC91-56B and made the determination that the guidance material does not provide adequate directions for an entity seeking compliance to AASFR.

10.The AAWG recommends that AC 91-56B be revised as delineated in Sections 2 and 3 of this report. A full draft of a proposed revision of AC 91-56B is included in Appendix C.

11. The AAWG reviewed AC 25.1529-1 and determined that the guidance material would not support compliance to the AASFR and further did not follow industry-accepted practice.

12. The AAWG recommends that AC 25.1529-1 be cancelled and incorporated in pertinent part into the proposed AC 120-AAWG.

13. The AAWG Recommends that AC 120-AAWG be promulgated as a means of compliance to 14 CFR 121.370a and 129.16 with respect to repairs. A copy of this AC is contained in Appendix B.

Task 3 Conclusions and Recommendations (WFD for RAMs)

14. For WFD evaluation, the AAWG concluded that the following two situations should be addressed:

a. The structural configuration of the RAM itself, if it is susceptible to WFD;

b. The effect of the RAM on baseline structure susceptible to WFD.

15. WFD actions for baseline structure should be defined prior to requiring an assessment of the effect of the RAM.

16. The determination of any maintenance actions required to preclude WFD should be done in context with the procedure defined in AC 120-AAWG for determination of the damage tolerance requirements for the RAM:

a. For those airplanes that need a survey to address DT for repairs, the WFD assessment should occur within the same timeframe (action and implementation plan;

b. For newer airplanes that will require WFD analysis for repairs and alterations, (e.g. 14 CFR Part 25 Amdt. 54 and beyond), the WFD action should occur when the airplane reaches DSG

c. For newer airplanes that only require WFD for alterations (e.g. 14 CFR Part 25 Amdt. 96 and beyond) the WFD action should occur at certification

17. Existing DAH documents, like the SRM and RAP, should be updated, in a timely fashion, to include consideration for WFD damage scenarios to support compliance to 121.WFD, where operation past DSG is defined.

18. To complete Task 3, the AAWG recommends that the TAEIG task the AAWG to assemble a group of technical experts for the development of the required technical basis on how to address WFD for RAMs. The work product of this activity would be material for inclusion in either FAA Advisory Circular 120-AAWG or yet another, to be determined, AC. A copy of the proposed Tasking is included in Appendix E of this report.

Task 4 Conclusions and Recommendations (Model Specific Programs)

19. The AAWG concurs with the ARAC Tasking in that it should oversee the timely development and implementation of model specific Compliance Documents and new and updated model specific data to support operator compliance.

20. The AAWG concurs that model specific STGs should be formed to identify the fatigue critical structure, and review existing data that could be used in support of compliance with the AASFR and that the AAWG oversee that activity.

21. The AAWG concluded that the cooperation of the Type Certificate Holders and the Design Approval Holders is necessary for operators to be able to comply with the AASFR.

22. The AAWG recommends that the DAH Model Specific Compliance Document, as delineated in AC 120-AAWG, be published by December 20, 2008, and the new and updated model specific data to support operator compliance be published by December 18, 2009. In addition, the AAWG recommends that the AAWG oversee the development of this data as delineated in Appendix E.

Appendix A: Copy of FAA Tasking Notice

Federal Register / Vol. 69, No. 93 / Thursday, May 13, 2004 / Notices

Pages 26641 through 26644

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

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

AGENCY: Federal Aviation Administration (FAA), DOT.

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

SUMMARY: The FAA assigned the Aviation Rulemaking Advisory Committee a new task to develop guidance that will support industry compliance with the Aging Airplane Safety Final Rule requirements that relate to supplemental structural inspections. This new tasking will also address certain aspects of recommendations made during a previous ARAC tasking related to widespread fatigue damage. This notice is to inform the public of this ARAC activity.

FOR FURTHER INFORMATION CONTACT: Mike Kaszycki, Federal Aviation Administration, Transport Standards Staff, 1601 Lind Avenue, SW., Renton, Washington 98055–4056, *mike.kaszycki@faa.gov.*

SUPPLEMENTARY INFORMATION:

Background

The FAA established the Aviation Rulemaking Advisory Committee to provide advice and recommendations to the FAA Administrator on the FAA's rulemaking activities with respect to aviation-related issues. This includes obtaining advice and recommendations on the FAA's commitments to harmonize Title 14 of the Code of Federal Regulations (14 CFR) with its partners in Europe and Canada.

Airplane Applicability of Tasking

This new tasking shall apply to transport category airplanes with a type certificated passenger seating capacity of 30 or greater, or a maximum payload capacity of 7,500 pounds or greater, operated under part 121 or under part 129 (U.S. registered airplanes).

Statement of Tasking

There are four major tasks to be completed under this tasking:

Task 1.—Repairs to Baseline Primary Structure and Repairs to Alterations and Modifications

Draft an Advisory Circular (AC) that contains guidance to support the following two paths of compliance with §§ 121.370a and 129.16 of the Aging Airplane Safety Interim Final Rule (AASIFR):

1. *Damage-tolerance-based inspection program developed by part 121 and 129 certificate holders:* Develop guidelines and procedures that will enable part 121 and 129 certificate holders to develop a damage-tolerance-based inspection program that addresses repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

2. *Model specific damage-tolerance-based inspection program:* Develop Guidance that can be used by Type Certificate (TC) holders, Supplemental Type Certificate (STC) holders, and Structural Task Groups to support the development of a model specific damage-tolerance-based inspection program. The model specific damage-tolerance-based inspection program will address repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The developed model specific inspection program will support part 121 and 129 certificate holders' compliance with the AASIFR.

A written report will also be submitted that includes an action plan for the implementation of the recommendations of task 1 that will be addressed in task 4 below. The report is to be submitted to the Aviation Rulemaking Advisory Committee (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.

In the process of drafting the AC, the ARAC should assess the effectiveness of AC 91–56B to provide guidance to TC and STC holders for developing damage-tolerance-based inspections and procedures for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The ARAC should do the following:

• Assess the effectiveness of AC 91– 56B to support Industry compliance with the AASIFR with respect to repairs.

• Document any improvements to the AC that would provide better direction with respect to the guidance for TC and STC holders in their development of damage-tolerance-based inspections and procedures for repairs.

The ARAC is requested to validate that the guidance material in the new AC will result in programs that provide a high degree of autonomy for part 121 and 129 certificate holders while supporting compliance with the AASIFR. In order to determine a rational approach for addressing repairs to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, and are not currently covered by a mandated program, the AC should provide guidance to the part 121 and 129 certificate holders and to the type certificate holder to address the seven issues listed below.

1. The significance of the airplane certification amendment level in providing direction for the development of damage tolerance inspections and methods for repairs.

2. The degree to which Supplemental Structural Inspection Documents/ Programs (SSID/P) or equivalent documents/programs provide direction to repair the structure using damage-tolerance-rated repairs. The assessment should apply to SSID/Ps or equivalent documents/programs developed for 14 CFR part 25 pre-amendment 25–45 transport airplane models having a maximum gross takeoff weight of 75,000 lbs or greater. The following should be identified:

• Areas of aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by SSID/ Ps or equivalent documents/programs

• Significant assumptions applied in developing SSID/Ps or equivalent documents/programs

• Any significant issues in the implementation of the requirements of SSID/Ps or equivalent documents/ programs

• Data from SSID/Ps or equivalent documents/programs that would be useful in supporting this new tasking

3. The degree to which an applicable airplane model's Airworthiness Limitations Section (ALS) provides direction to repair the structure using damage-tolerance-rated repairs. This assessment should apply to damage-tolerance-based inspection programs/ data developed for 14 CFR part 25 amendment 25–45 or later transport airplane models having a maximum gross takeoff weight of 75,000 lbs or greater. The following should be identified:

• Areas of aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by a damage-tolerance-based inspection program/data

• Any significant issues in the implementation of the requirements of the damage-tolerance-based inspection programs/data

• Data from the damage-tolerance-based inspection programs that would be useful in supporting this new tasking

4. The degree to which existing Repair Assessment Guideline documents developed for §§ 121.370 and 129.32 provide damage-tolerance-based inspections for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The assessment should identify the following:

• Areas of the aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by these documents

• Data from these documents that would be useful in supporting this new tasking

5. Identify the issues/difficulties industry has encountered with establishing damage-tolerance-based inspections and procedures for repairs as required by various FAA approaches in issuing SSIP airworthiness directives (*e.g.*, 727/737 AD 98–11–03 R1,

AD 98– 11–04 R1 verses other SSIP AD approaches like the 747). The assessment should identify the following:

• Comparison of approaches with pros and cons for each approach

• Data from these documents that would be useful in supporting this new tasking

6. Assess the extent to which Structural Repair Manuals (SRM) provide damage-tolerance-based inspections for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

7. Assess the need to include damage-tolerance-based inspections and procedures in TC and STC Holder issued Service Bulletins (SB) that provide repair instructions for aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

Task 2.—Alterations and Modifications to Baseline Primary Structure, Including STCs and Amended Type Certificates (ATCs)

Prepare a written report assessing how an operator would include damage tolerance-based inspections and procedures for alterations and modifications made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. This assessment would include, but is not limited to, alterations and modifications performed under an STC, ATC, FAA field approval (*e.g.*, FAA form 337) and/or FAA approved TC holder design data. The report should include a recommendation on the best means to develop damage-tolerance-based inspections and procedures for these alterations and modifications and the applicability of AC 91–56B. The ARAC should assess the effectiveness of AC 91–56B to provide guidance to STC holders for developing damage-tolerance-based inspections and procedures for alterations and modifications. The ARAC should do the following:

• Assess the effectiveness of AC 91– 56B to support Industry compliance with the AASIFR with respect to alterations and modifications.

• Document any improvements to the AC that would provide better direction with respect to the guidance for STC holders in their development of damage-tolerance-based inspections and procedures for alterations and modifications.

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 should also provide a recommendation on the means of compliance provided by the AC developed in Task 1 in regards to repairs installed on STC or ATC approved alterations and modifications. 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 (FAA concurrence is necessary to ensure actions will support industry compliance with the AASIFR).

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.

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 the 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.

Schedule

The tasking will be performed in two phases. In Phase 1, the ARAC will provide to the FAA the results of Tasks 1 through 3. Phase 1 should be accomplished by December 16, 2005. In Phase 2, the Structures Task Groups, under the direction of the ARAC, should produce the model specific guidance material, Task 4, using the guidelines and procedures of the AC produced in Phase 1. The ARAC will be responsible for coordinating and overseeing the STG's application of the AC. Phase 2 documents should be completed by December 18, 2009.

ARAC Acceptance of Task

ARAC accepted the task and assigned the task to the Airworthiness Assurance Working Group, Transport Airplane and Engine Issues. The Structural Task Groups (STG) composed of type certificate and part 121 and 129 certificate holders familiar with the specific model aircraft will support the working group. The working group will serve as staff to ARAC and assist in the analysis of the assigned task. ARAC must review and approve the working group's recommendations. If ARAC accepts the working group's recommendations, it will forward them to the FAA.

Working Group Activity

The Airworthiness Assurance Working Group must comply with the procedures adopted

by ARAC. As part of the procedures, the working group must:

1. Recommend a work plan for completion of the task, including the rationale supporting such a plan for consideration at the next meeting of the ARAC on transport airplane and engine issues held following publication of this notice.

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

3. Draft the appropriate documents and required analyses and/or any other related materials or documents.

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

Participation in the Working Group

The Airworthiness Assurance Working Group will be composed of technical experts having an interest in the assigned task. A working group member need not be a representative or a member of the full committee. If you have expertise in the subject matter and wish to become a member of the working group you should write to the person listed under the caption **FOR FURTHER INFORMATION CONTACT** expressing that desire, describing your interest in the task, and stating the expertise you would bring to the working group. We must receive your request to participate no later than May 28, 2004. The assistant chair, the assistant executive director, and the working group chair will review your request and will advise you whether your request is approved. If you are chosen for membership on the working group, you must represent your aviation community segment and actively participate in the working group (*e.g.*, attend all meetings, provide written comments when requested to do so, *etc.*). You must also devote the resources necessary to support the working group in meeting any assigned deadlines. You must keep your management chain and those you may represent advised of working group activities and decisions to ensure that the proposed technical solutions don't conflict with your sponsoring organization's position when the subject being negotiated is presented to ARAC for approval.

Once the working group has begun deliberations, members will be added or substituted only with the approval of the assistant chair, the assistant executive director, and the working group chair.

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

Meetings of the ARAC will be open to the public. Meetings of the 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. The FAA will make no public announcement of working group meetings.

Issued in Washington, DC, on May 4, 2004.

Anthony F. Fazio,

Executive Director, Aviation Rulemaking Advisory Committee.

[FR Doc. 04–10816 Filed 5–12–04; 8:45 am]

BILLING CODE 4910–13–P

Appendix B: Draft AC 120-AAWG

ADVISORY CIRCULAR

DAMAGE TOLERANCE INSPECTIONS FOR REPAIRS

TABLE OF CONTENTS

CHAPTER 1. PURPOSE OF THIS ADVISORY CIRCULAR

100. PURPOSE.

a. This Advisory Circular (AC) provides guidance material for design approval holders (DAH) and operators in developing and incorporating Damage Tolerance Inspections and Procedures (DTIP). The AC will support compliance with 14 CFR Parts 121.370a and 129.16, the Aging Airplane Safety Final Rule (AASFR) with respect to repairs. This AC is applicable to repairs to structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. This structure is referred to in this AC as fatigue critical structure.

b. This includes repairs made to the as delivered airplane structural configuration as well as repairs to alterations and modifications. For operators to comply they will need to demonstrate that new and existing repairs will have an evaluation and have DTIP or other procedures implemented if needed. This AC provides guidance for addressing both new and existing repairs.

101. APPLICABILITY.

This AC is applicable to Type Certificate Holders, Supplemental Type Certificate Holders and operators of transport category airplanes with a type certificated passenger seating capacity of 30 or greater, or a maximum payload capacity of 7,500 pounds or greater. The applicability is limited to airplanes operated under Parts 121 or 129 (US Registered Airplanes).

102. DAMAGE TOLERANCE INSPECTIONS AND PROCEDURES, DAMAGE TOLERANCE EVALUATION PROCESSES (DTE PROCESSES) AND DAMAGE TOLERANCE DATA (DT DATA).

a. The term Damage Tolerance Inspections and Procedure used in the AASFR is synonymous with the term Damage Tolerance Data (DT data) used in this AC and described below. These Damage Tolerance Inspections for repairs supplement existing regulator approved maintenance programs including those contained in the instructions for continued airworthiness, scheduled maintenance programs, SSID and ALI programs, Service Bulletins, and Repair Assessment Programs.

b. Amendment 45 to 14 CFR Part 25 introduced the use of damage tolerance principles. This approach requires an evaluation of the structure to determine its crack growth and residual strength characteristics. The evaluation supplies the information necessary to determine a maintenance plan for continued airworthiness. For this AC, the term DTE processes refers to an approved process, that includes, analysis and/or tests and service data, that leads to a determination of a continuing airworthiness maintenance plan, including inspections (i. e. DTI), or other procedures for a repair or replacement of fatigue critical structure. Consistent with the guidance provided by this AC, a DTE process could entail anything from a rigorous analysis methodology for use by a structures analyst to generic guidelines for operator use. This process will enable a survey and assessment of existing repairs to be made. In this AC, DTE processes plus DTI is referred to collectively as DT data.

c. DTE processes typically result in four items that comprise the DTI. Those are as follows:

- Where to inspect.
- When to start inspecting.
- How to inspect.
- How often to repeat the inspection.

d. For some airplane models, the requirements of the AASFR are beyond the scope of the original certification level. For these airplanes, development of DT data and incorporation of that data into the existing maintenance program is required. For other models, there are DT data included in various documents, for example Supplemental Structural Inspection Document/Program (SSID/P), Repair Assessment Guidelines (RAGs), Airworthiness Limitation Sections (ALSs), Structural Repair Manuals (SRMs), and Airworthiness Directives (ADs). Operators may use these DT data in part or in whole to support compliance with the requirements of the AASFR for repairs.

e. Sometimes, the results of the DTE process may indicate that inspections are either impractical or unreliable. In such cases, the continued airworthiness of the airplane is assured by establishing a replacement time for the repair.

103. OVERVIEW OF DT DATA DEVELOPMENT AND INCORPORATION.

a. Developing DT data involves accomplishing tasks typically performed by a DAH assisted by interested operators. The product is an FAA-ACO approved model specific compliance document that contains the output from the tasks. Incorporation of the DT data into a maintenance program involves accomplishing tasks that are typically performed by an operator. The product is an FAA-PMI approved airplane specific Operator Implementation Plan.

b. It is expected that DAHs, operators and regulators would develop model specific compliance documents. Industry Task Groups such as the Airworthiness Assurance Working Group (AAWG) would perform this task.

c. The following is a summary of the tasks necessary to develop DT data for repairs and incorporate it into an operator's maintenance program:

(1) DAH Tasks. The following is an overview of the DAH tasks that are further developed in Chapter 2.

(a) Identify the affected airplane model, models, or airplane serial numbers the DT data will be applicable to.

(b) Identify the fatigue critical structure.

(c) Identify the certification level.

(d) Review of existing DT data.

(e) Develop additional DT data.

(f) Establish Implementation Schedule.

(g) Prepare Compliance Document**.** This is a model or airplane specific document that contains the information from Paragraphs (a) through (f) above. The operator will use this document to develop an implementation plan for complying with the AASFR. In order to support operator compliance to the AASFR, the DAH should submit the Compliance Document to the FAA-ACO for approval and should make it available by December 18, 2009.

(2) Operator Tasks. The following is an overview of the operator tasks that are further developed in Chapter 3.

(a) Review The Applicable Compliance Documents**.**

(b) Development Of An Operators Implementation Plan. This is specific to the identified airplane or group of airplanes to which the Plan applies and contains information from Paragraph **(1)(g)** above. The Operator will submit the Implementation Plan for approval by the FAA-PMI.

(c) Incorporate The DT Data For New And Existing Repairs into Operators Maintenance Program.

104 thru 199 RESERVED.

CHAPTER 2. DESIGN APPROVAL HOLDERS TASKS

200. GENERAL INFORMATION ABOUT THIS CHAPTER.

This chapter gives guidance to design approval holders for developing data to support operator compliance with the rule. This includes the development of damage tolerance procedures, DTE processes, and DT data.

201. DEVELOPMENT OF COMPLIANCE DOCUMENTS.

a. Persons supporting the operation of airplanes under 14 CFR 121 and 129 should use the following guidance material to develop data necessary to facilitate operator compliance. Airplanes certified to Amendment 54, or later, may not need additional DT data to be developed. While data may not need to be developed, an operator will still need to demonstrate to his PMI how his existing maintenance program meets the intent of the AASFR relative to new and existing repairs.

b. To facilitate compliance with the AASFR with respect to repairs, compliance documentation should be created that will encompass all fatigue critical structure, including repairs to repairs, alterations, and modifications (RAM) as necessary. The compliance document will be applicable to a specific airplane model or airplane serial number. The documentation should provide the data necessary for developing an Operator Implementation Plan with respect to a given airplane. The Compliance Document should also include implementation schedule information as well as specific guidance on which repairs will require evaluation. The process for evaluation of repairs contained in this AC considers both existing and future repairs. Existing repairs will be brought into the program using the implementation plan and airplane surveys after December 20, 2010 (See Appendix 5). New repairs, installed after December 20, 2010 will be required to have DT data provided within the guidelines contained in Appendix 4.

c. Where specific DT data needs to be developed to support compliance to the AASFR, it is recommended that the model-specific Compliance Document be produced as a joint effort between the DAH, operators, and Regulatory Authorities. In previous aging aircraft programs, the AAWG formed Structures Task Groups (STGs) to develop the model specific programs. Where necessary an STG for this activity should be formed and tasked to develop the model-specific Compliance Document.

d. Figure 1 shows the process that may be used to produce a Compliance Document that supports compliance with the AASFR for repairs to fatigue critical structure:

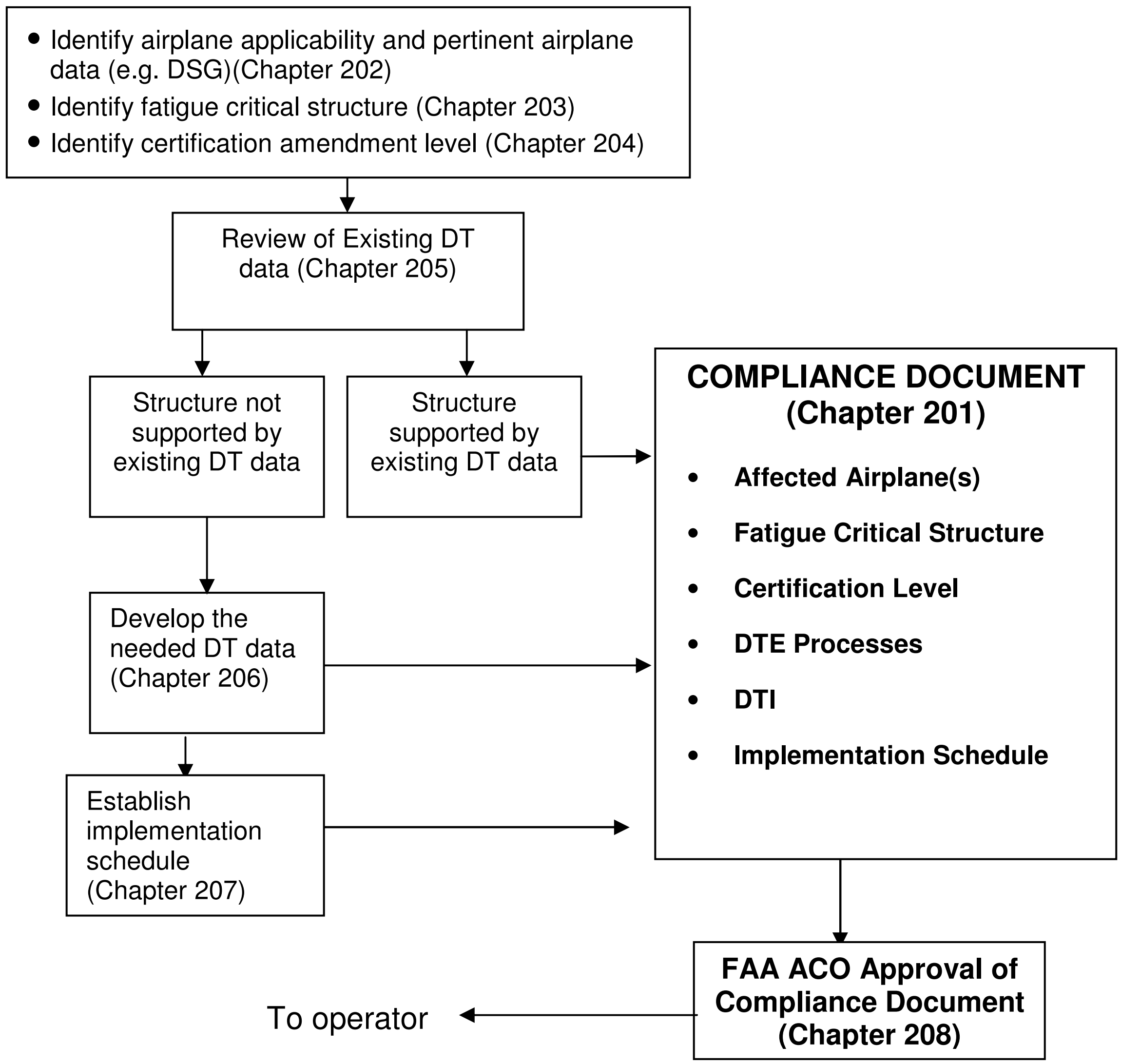


Figure 1. Development of a Compliance Document.

202. IDENTIFICATION OF AFFECTED AIRPLANES.

The airplane model and model variations or serial numbers, including gross weights, applicable to the Compliance Document should be identified. For each model of airplane, the DAH will identify the DT data to support compliance with the AASFR. Some models may not require additional data

203. IDENTIFICATION OF FATIGUE CRITICAL STRUCTURE.

a. The DAH will identify and make available in the Compliance Document a description of structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure for each applicable airplane model. This structure is referred to as “fatigue critical structure”. Guidance for identifying this structure can be found in AC 25.571-1C. When fatigue critical structure is repaired the repaired fatigue critical structure requires DTE to comply with the AASFR. This includes repairs to alterations and modifications of fatigue critical structure. Structure not defined as fatigue critical structure would not require DTE when repaired.

b. When identifying fatigue critical structure, it should be considered that some SSID programs or ALS contained in the Instructions for Continued Airworthiness might only include supplemental inspections of critical elements of the fatigue critical structure as determined by the Damage Tolerance Analysis. Other areas of structure may require supplemental inspections if repaired. In defining the fatigue critical structure it is not sufficient to consider only that structure contained in the SSID program or ALS.

c. STC Holders should obtain the description of fatigue critical baseline structure from the Type Certificate Holder. If the alteration affects this fatigue critical structure, any repairs to the alteration must have a Damage Tolerance Assessment performed. This damage tolerance assessment must address any fatigue critical structure of the alteration and of the baseline structure that is affected by the repair. This information should be incorporated into a compliance document that is unique to the alteration.

204. CERTIFICATION AMENDMENT LEVEL.

In order to understand what data is required for compliance with the AASFR for repairs, the DAH should identify the amendment level of the original certification relative to 14 CFR Part 25.571. The amendment level is useful in identifying what DT data may be applicable for compliance to the AASFR and what standard should be used for development of data for AASFR compliance. The two airplane groups that are relevant to the AASFR are:

a. Group A - Airplanes certified before 14 CFR 25.571 Amendment 25-45, damage tolerance requirements. These airplanes were not evaluated for damage tolerance as part of the original type certification. Therefore, the requirements of the AASFR are beyond the scope of the original certification amendment level. Repairs to fatigue critical structure will need development of DT data unless previously accomplished.

b. Group B - Airplanes certified to 14 CFR 25.571 Amendment 25-45 or beyond, Repairs to these aircraft will need to meet their certification level. Although these airplanes were evaluated for damage tolerance, they may not have repair data that includes DT data. In this situation, the DAH and operators may need to identify and perform a DTE of these repairs and develop DTI or other procedures.

205. REVIEW OF EXISTING DT DATA.

a. Introduction

(1) Based on the certification amendment level and existing rules, the DAH developed documents that may provide DT data to support compliance with the AASFR for repairs. These documents may include:

- **(a)** Repair Assessment Guidelines (RAG)
- **(b)** Structural Repair Manual
- **(c)** Individual Repairs
  - **i** To areas covered by ALS, SSIP and RAP
  - **ii** Other individual repairs
- **(d)** Service Bulletins that provide
  - **i** Inspections for RAMs
  - **ii** Significant modification or
  - **iii** Repair service bulletins
- **(e)** ADs that mandate
  - **i** Modifications or repairs
  - **ii** Inspections to STCs

(2) Review each of the items above to determine the applicability of the data for compliance to the AASFR.

b. Identifying Existing DT Data.

(1) Identify repairs that have existing DT data that will support compliance with the AASFR. This material will form a portion of the data for the Compliance Document.

(2) The following documents may contain data that may be applicable in showing compliance to the AASFR.

(a) RAGs. The programs developed for complying with §121.370 and 129.32 resulted in model specific repair assessment guidelines (RAGs). These documents provide support in complying with the AASFR for repairs to the fuselage pressure boundary. Additionally, under certain circumstances, the RAG documents developed may be applicable to repairs to STC's that are modifications to the fuselage pressure boundary.

(b) SBs, ADs. Review Service Bulletins and ADs that provide instructions to inspect, or repair fatigue critical structure. Determine if it supports compliance with the AASFR. The DAH should propose a process for review of these bulletins.

(c) SRMs. The Structural Repair Manual may contain some of the information required for compliance to the AASFR and other existing programs, such as the SSIP and RAP. Review SRMs to identify all repairs to fatigue critical structure and if those repairs have had DT data established.

206. DEVELOPMENT OF ADDITIONAL DT DATA TO SUPPORT COMPLIANCE.

a. Introduction.

(1) When developing DT data, use of the damage tolerance requirements depends on the certification level of the affected airplane. For Group A airplanes use the requirements of 14 CFR 25.571 at Amendment 45 as a minimum standard. For Group B airplanes use the requirements that correspond to their original certification level as a minimum standard.

(2) Consider the following repairs and develop DT data according to the minimum standard determined in (1) above:

(a) SRM Repairs.
(b) SB Repairs.
(c) AD Mandated Repairs.
(d) DAH reviewed and approved repairs that have general interest (multiple airplane approvals).
(e) Other repairs, including third-party approved repairs and repairs that deviate from published repairs that otherwise qualify as damage tolerant.

(3) For future repairs, damage tolerance evaluation on an individual repair basis is acceptable. However, it may be more efficient to use published repair instructions such as SRMs or RAGs that contain already approved DT data. For published repair data to be acceptable, it should contain a statement of DTE accomplishment.

(4) For existing repairs that are identified during an individual airplane review, there are at least two possible approaches to evaluate a repair. The first would involve a damage tolerance analysis on individual repairs as those repairs are identified. This will be necessary for unique and complex non-routine repairs. Another approach would be to develop guidelines to assess repairs that are not addressed by existing RAGs developed for compliance to 14 CFR 121.370. The development of these additional guidelines is complex and therefore requires the support of the DAH.

b. Performing DTEs and developing DTI on a case-by-case basis. If performing DTEs and developing DTI on a case-by-case basis, use the guidance included in AC 25.571 consistent with the certification amendment level identified in Chapter 2, paragraph 204 of this AC.

c. Development of additional repair assessment guidance. The update of the SRM, SBs, together with the existing RAG documents form the core of the information supplied to the operator for compliance to the AASFR. A means will be developed and documented in the compliance document to assist the operator in evaluating repairs using the updated published standards and to determine if additional DAH support is necessary. This support may be in the form of individual repair DTA data requests or new repair evaluation guidelines (e.g. may cover fatigue critical structure of the wing, fuselage, empennage, etc.). The means developed should provide operators with a high degree of confidence that they can comply with the requirements of the AASFR.

In the development of new evaluation guidelines, the percentage of existing repairs that could be addressed by the new repair guidance material should weighed against the resources and time required to develop and have the guidance approved. General guidance on development of this material can be found in AC 120-73 even though this guidance is for the Fuselage Pressure Boundary.

Damage tolerance inspections and procedures means establishing the following:

(1) A threshold for when to commence inspections of the structure.
(2) A repetitive interval for repeat inspections
(3) A means of inspection.
(4) Occasionally, a life limit for replacing structure.

For repairs, the following repair category terminology that is contained in AC 120-73 is used herein to describe the maintenance requirements.

For Category A repairs, normal maintenance procedures (inspection threshold and /or BZI) are sufficient to provide the required damage tolerance coverage.

For Category B repairs, items 1, 2, and 3 above are normally provided as part of the damage tolerance package.

For Category C repairs, all four items are provided as necessary.

d. SRMs. Based on the review performed in Chapter 205, determine if the SRM needs revision to support compliance with the AASFR. Base this determination on the following:

(1) Whether the existing SRM contains an adequate description of damage tolerance data for the specific model. This includes defined repair categories.

(2) Whether normal maintenance procedures (for example the inspection threshold and/or baseline zonal inspection program) covers Category A repairs.

(3) Whether the SRM contains an identification of fatigue critical structure for the model specific airplane that, if repaired, will need a damage tolerance assessment.

(4) Whether SRM Chapter 51 standard repairs have a DT evaluation.

(5) Whether all SRM specific repairs for fatigue critical structure have DT Data.

(6) Whether there is specific guidance on the size of repairs that would qualify as Category A repairs.

(7) Whether there is any guidance on proximity of repairs and the effect of this condition on damage tolerance characteristics.

(8) The need to address superseded repairs and how DT data for future superseded repairs will continue to be made available.

e. Service Bulletins. Based on the review performed in Chapter 205 determine if the SBs need DT data to support compliance with the AASFR. Compliance Document needs to identify the status of the DT data for those service bulletins.

207. IMPLEMENTATION SCHEDULE.

The implementation schedule described in this Paragraph represents an acceptable time line to establish DT data and continued airworthiness maintenance plans for both existing and new repairs. Justify any deviation to the time line and present it to the FAA oversight office for approval. Include the information contained in this chapter in the Compliance Document to support the operator in developing an implementation plan for his particular fleet of airplanes. This Implementation Schedule will support compliance to 14 CFR 121.370a (1) with respect to the requirement to address the adverse effects repairs have on fatigue cracking and the inspection of fatigue critical structure. In principle this implementation schedule is similar to the implementation schedule adopted for compliance to 14 CFR 121.370.

a. Existing repairs that already have DT data developed and in place in the maintenance program. These repairs require no further action.

b. Existing repairs that either require developing DT data or have not had ICA embodied in the maintenance program. Identify and evaluate all existing repairs to fatigue critical structure. For the purposes of compliance to the AASFR, only existing repairs that reinforce (e.g. restore strength) the fatigue critical structure need to be considered; this typically excludes maintenance actions such as blend-outs, plug rivets, trim-outs, etc. For those existing repairs that do not have DT data or other procedures implemented, establish that data according to an FAA approved plan. Assessing existing repairs consists of:

- Airplane Repair Survey.
- Identification and Disposition of repairs requiring immediate action.
- DTI Development.

Appendix 5 defines these three steps. The timing allowance for each of these steps for any given airplane depends on the age of the airplane on December 18, 2009. The following program will support the DAH development of an Implementation Schedule for the Compliance Document. This implementation schedule would be incorporated as part of the Operator's Implementation Plan developed in Chapter 3 of this AC.

(1) Implementation Schedule for Survey and Disposition.

(a) Airplanes less than 75% DSG on December 18, 2009. Operators would complete a survey at the first D-check after 75% DSG, not to exceed DSG, completing steps 1 and 2 of the DTI assessment process (see Appendix 5). After accomplishing step 1, complete step 3 of Appendix 5 within 12 months.

(b) Airplanes between 75% DSG and DSG on December 18, 2009. Operators would complete a survey of these airplanes completing steps 1 and 2 of the DTI assessment process (see Appendix 5) at or before the next major check (equivalent to a D-check) after December 20, 2010, not to exceed DSG or 6 years whichever is greater. After accomplishing step 1, complete step 3 of Appendix 5 within 12 months.

(c) Airplanes greater than the DSG on December 18, 2009. Operators would complete a survey of these airplanes completing steps 1 and 2 of the DTI assessment process (see Appendix 5) at or before the time limit equivalent to a D-check after December 20, 2010, not to exceed 6 years. Operators should not defer the implementation of the program until the end of the D-check time period. For example, if an operator had 30 airplanes over DSG on December 18, 2009 and was operating on a six year D-check equivalent, the operator would inspect approximately 5 equivalent airplanes each year until all of the airplanes were inducted into the program. Within 12 months after accomplishing Step 1, complete step 3 of Appendix 5.

NOTE: The DAH will identify the established DSG for a particular airplane type that is representative of the airplane considering the probable variation of the number of flight hours per cycle that could exist in the fleet.

(2) Implementation of DTI.

(a) Once the DTI is known, accomplish the first inspection of the repair according to the schedule of the DTI as follows:

- **i** Inspect the repair before the inspection threshold or within a time limit equivalent to a C-check from accomplishment of the assessment, whichever occurs later.
- **ii** If the age of the repair is unknown, use the aircraft age in cycles or hours.

(b) Implement repeat inspection intervals per the instructions provided.

d. New Repairs. Unless already required by the airplane certification level or other FAA approved program, all new repairs to fatigue critical structure installed beginning December 21, 2010, and thereafter must have DTE performed. Implement DTI according to the process described in Appendix 4, “Approval Process for New Repairs”. This includes blendouts, trim-outs, etc. that are beyond published DAH limits.

e. Repairs to Removable Structural Components. Fatigue critical structure may include structure on removable structural parts or assemblies that can be exchanged from one aircraft to another such as door assemblies, flight control surfaces, etc. In principle, the DT data development and implementation process also applies to repairs to fatigue critical structure on components. During their life history, however, these parts may not have had their flight times recorded on an individual component level because of removal and reinstallation on different airplanes multiple times. These actions may make it impossible to determine the age or total hours/cycles. In these situations, guidance for handling DT data development and implementation for existing and new repairs is given in Appendix 6.

208. FAA ACO APPROVAL OF COMPLIANCE DOCUMENT.

The FAA oversight office for the affected airplane or STC will approve the Compliance Document and any revision to an FAA-approved Compliance Document.

209 THRU 299 RESERVED.

CHAPTER 3. OPERATOR TASKS

300. GENERAL INFORMATION ABOUT CHAPTER 3.

This Chapter will guide operators on the procedures to obtain damage tolerance inspections and procedures. This Chapter will additionally guide operators on how to revise their maintenance programs as required by 14 CFR 121.370a and 129.16.

301. DEVELOPMENT OF AN OPERATORS IMPLEMENTATION PLAN

The AASFR requires affected air carrier certificate holders to incorporate FAA-approved DTE Processes and DTI into their maintenance programs by December 20, 2010 for repairs to fatigue critical structure. This includes both existing and new repairs and repairs to repairs, alterations and modifications of fatigue critical structure. The means of incorporating DT data into a certificate holder's FAA-approved maintenance program is subject to approval by the certificate holder's Principal Maintenance Inspector (PMI) or other airworthiness inspector. The Compliance Document developed using Chapter 2 of this AC provides the basic guidance, including identification of the fatigue critical structure, DT data and implementation schedule information.

Incorporate the information that includes the Compliance Document processes, data, and requirements into the operator's existing maintenance program in a way that best fits their existing maintenance programs. The PMI or airworthiness inspector will then approve the Operator's Implementation Plan.

302. REVIEW OF APPLICABLE COMPLIANCE DOCUMENTS.

a. For each affected airplane in an operator's fleet, the operator should review the FAA ACO-approved Compliance Documents (discussed in Chapter 2, above) that are applicable. The Compliance Document will identify all fatigue critical structure, the DT data for the fatigue critical structure, and implementation schedule information for incorporating DT data into the operator's maintenance program.

b. In addition, the operator should review any additional FAA ACO approved Compliance Documents associated with a given model aircraft, for repairs to RAMs and third-party approved repairs. These may be applicable to the entire model fleet or to individual aircraft within a given fleet type. These Compliance Documents will also identify all fatigue critical structure for that fleet type, the DT data for the fatigue critical structure, and implementation schedule information for incorporating DT data into the operator's maintenance program.

c. Figure 2 below shows how an operator can develop an Operator Implementation Plan for airplanes in his fleet using the Compliance Document. While the

Implementation Plan is airplane specific, it may incorporate processes and procedures that are applicable to other airplanes operated by a certificate holder. This includes administrative procedures for applying elements common to each Implementation Plan. Consider the guidance in the following flow-chart when developing an Operator Implementation Plan.

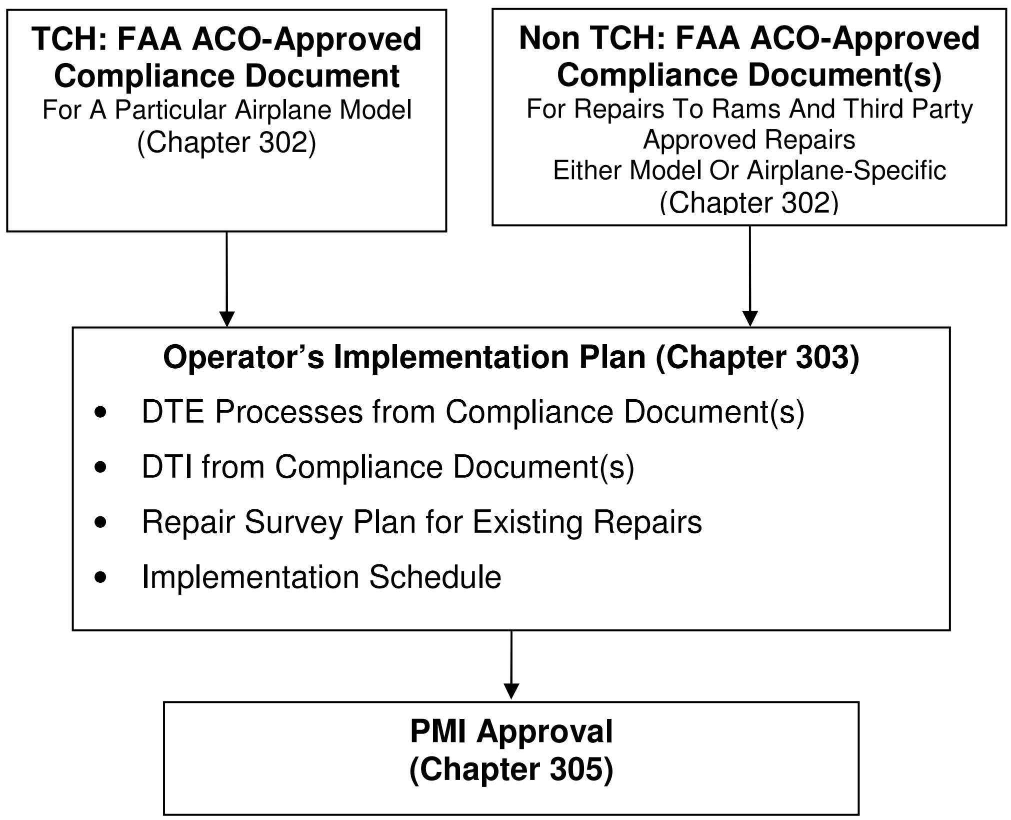


Figure 2. Operator's Implementation Plan Approval Process.

303. INCORPORATION OF DT DATA FOR NEW AND EXISTING REPAIRS.

After the reviews of the applicable Compliance Document are complete, the operator should include the following into an Operator Implementation Plan:

a. A process to ensure that all new repairs to fatigue critical structure will be evaluated for damage tolerance and have DTI or other procedures implemented.

b. A process to ensure that all existing repairs to fatigue critical structure are evaluated for damage tolerance and have DTI or other procedures implemented. This process would include:

(1) A review of operator processes to determine if DT data for fatigue critical structure is incorporated throughout the life of the airplane. If so, no further action is required for existing repairs.

(2) Incorporation of processes to survey existing repairs to fatigue critical structure and determine DTI for those repairs. Derive these processes from the Compliance Document applicable to those airplanes. Incorporate them into the operator's maintenance program within the time frame given in the Compliance Document.

c. An implementation schedule following guidance provided in the Compliance Documents.

d. Repair Survey Plan. Utilizing the survey parameters from chapter 2 above the operator would devise a plan to survey its airplanes for repairs that may need DT data developed. This survey plan may be divided into three groups of airplanes, those that are below 75% DSG, those that are between 75% DSG and DSG and those above DSG on December 18, 2009. (Note: In the following three-implementation plans, DSG is in cycles.) Examples of typical calculations to determine when an airplane would need to be surveyed are contained in Appendix 8.

(1) For an airplane that has not reached 75% DSG on Dec. 18, 2009. The operator must perform the survey at the first D-check after 75% DSG, not to exceed DSG. A "D" check or equivalent means an airplane maintenance visit where all the major structural inspections are performed. In some cases this may be a formal "D" check or, in the case of MSG-2 or 3 based maintenance program, the "D" check equivalent may be the "C" check multiple that contains the majority of the major structural inspections such as a "C-4" check sometimes called a Heavy Maintenance Visit (HMV).

(2) For an airplane that has reached 75% DSG but is less than or equal to DSG on Dec. 18, 2009. The operator must perform the survey at the next D-check, not to exceed DSG or 6 years whichever is greater.

(3) For an airplane that has exceeded DSG, the survey should be accomplished before the time limit of the next "D" check, or 6 years, which ever is earlier. Operators should have a procedure in place to prorate airplane surveys in order to evenly spread out the surveys that need to be accomplished over the six-year time frame.

e. Implementation Techniques. Use one of the two techniques below to implement DTI for repairs:

(1) The first technique involves incorporation of DT data directly into the operator's maintenance program.

(2) The second technique involves an alternative to tracking individual repairs. In this approach, incorporate the DTI as part of an operator's routine maintenance program. This approach is well suited for operators of large fleets and would entail evaluating repairs at predetermined planned maintenance visits as part of the maintenance program. This technique would require the operator to choose an inspection method and interval using an FAA-approved DTE. Use the regular FAA-approved maintenance or inspection program for repairs where the inspection requirements utilize the chosen inspection method and interval. Repairs added between the predetermined maintenance visits, including Category B and C repairs installed at remote locations, should have a threshold greater than the predetermined maintenance visit. It may also be individually tracked to account for the repair's unique inspection method and interval requirements. This would ensure the airworthiness of the structure until the next predetermined maintenance visit, when the repair would be evaluated as part of the repair maintenance program.

Category B or C repairs where inspection requirements are not fulfilled by the chosen inspection method and interval would need additional attention. These repairs would either require upgrading to allow utilization of the chosen inspection method and interval, or individually tracking to account for the repair's unique inspection method and interval requirements.

Note: DTI thresholds and repeat intervals for individual repairs cannot be exceeded without FAA approval.

304. EXISTING OPERATOR RESPONSIBILITIES.

a. Reporting Requirements. There are no added reporting requirements associated with the AASFR. However, the FAA encourages operators to report significant findings to the type certificate holders to ensure that prompt fleet action is taken. Existing reporting requirements under 14 CFR § 121.703 still apply.

b. Recordkeeping Requirements. Once the Operator receives approval for the Implementation Plan, include the list of the required inspections and their status in the records review requirements of §§121.368 and 129.33. Existing recordkeeping requirements are still applicable.

c. Transfer of Airplanes after December 20, 2010. After December 20, 2010, before adding an airplane to an air carrier's operations specifications or operator's fleet, the following should apply:

(1) For airplanes previously operated under an FAA-approved maintenance program, the new operator may use either the previously PMI approved Operator Implementation Plan or their own PMI approved Implementation plan.

(2) For airplanes not previously operated under an FAA-approved

maintenance program, the operator develops and implements an Operator Implementation Plan. If the airplane's DSG and compliance times are exceeded, accomplish any outstanding DTI according to a schedule approved by the PMI.

d. Operation of Leased Foreign-Owned Airplanes. Acquisition of a leased foreign-owned airplane for use in operations under 14 CFR parts 121, or 129 will require the certificate holder to develop and implement an Operator's Implementation Plan

e. Maintenance Program Changes. When revising a maintenance program and the continued airworthiness of repairs to fatigue critical structure is dependent on that program, the operator must evaluate the impact of the change on continued airworthiness. For example, the maintenance program inspection intervals may determine Category A repairs (Ref AC 120-73, Stage 2: Repair Classification). If revising the maintenance program in a manner that changes the inspection intervals, the operator must assess that effect on repairs that are Category A.

305. FAA PMI APPROVAL OF OPERATOR'S IMPLEMENTATION PLAN.

The certificate holder's Principal Maintenance Inspector (PMI) or other airworthiness inspector is responsible for approving the means for incorporation of the DT data for repairs into a certificate holder's FAA-approved maintenance program. An operation specification revision will show approval of the plan.

306. THRU 399 RESERVED.

CHAPTER 4. ADMINISTRATIVE REQUIREMENTS

400. ADVISORY CIRCULAR AVAILABILITY

HOW DO I GET A COPY OF THE PUBLICATIONS REFERRED TO IN THIS AC?

a. The CFR and those ACs for which a fee is charged may be obtained from the Superintendent of Documents at the following address. A listing of the CFR and current prices is located in AC 00–44, *Status of Federal Aviation Regulations*, and a listing of all ACs is found in AC 00–2, *Advisory Circular Checklist*.
Superintendent of Documents
P.O. Box 371954
Pittsburgh, PA 15250–7954

b. To be placed on our mailing list for free ACs, contact—
U.S. Department of Transportation
Subsequent Distribution Office
SVC–121.23
Ardmore East Business Center
3341Q 75th Avenue
Landover, MD 20785

c. You may view and print the CFR and Aircraft Certification Service and Flight Standards Service ACs on the FAA Web page at http://www.airweb.faa.gov/rgl.

401. WHO DO I CONTACT FOR MORE INFORMATION ABOUT THIS AC?

For information concerning this AC, contact the Transport Airplane Directorate, ANM-115 at 425-227-2116.

402. WHO DO I SUBMIT COMMENTS TO ABOUT THIS AC?

Submit direct comments regarding this AC to—
U.S. Department of Transportation
Federal Aviation Administration
Aircraft Maintenance Division, AFS-300
800 Independence Avenue SW.
Washington, DC 205

403 THRU 499 RESERVED.

APPENDIX 1. RELATED REGULATIONS AND DOCUMENTS

The following is provided as a means to access current rules and regulations together with previous ARAC Recommendations from the AAWG. Documents noted by an (*) are available at the following web site.

http://www.faa.gov

1. Title 14 of the Code of Federal Regulations (14 CFR): The following Regulations are referenced in this AC:

a. Part 21, §21.101*
b. Part 25, §§ 25.571*, 25.1529*
c. Part 43, §§ 43.13*, 43.16*
d. Part 91, § 91.403*
e. Part 121, §§ 121.368*, 121.370*, 121.370a*
f. Part 129, §§ 129.16*, 129.32*, 129.33*

2. Advisory Circulars (AC): The following Advisory Circulars are reference in this AC:

a. AC 21.101-1, Change Product Rule*
b. AC 25.571-1, Damage Tolerance and Fatigue Evaluation of Structure*
c. AC 25.571-1A, Damage Tolerance and Fatigue Evaluation of Structure*
d. AC 25.571-1B, Damage Tolerance and Fatigue Evaluation of Structure*
e. AC 25.571-1C, Damage Tolerance and Fatigue Evaluation of Structure*
f. AC 25.1529-1, Instructions for Continued Airworthiness of Structural Repairs on Transport Airplanes*
g. AC 91-56A, The Continued Airworthiness of Older Airplanes*
h. AC 91-56B, The Continued Airworthiness of Older Airplanes*
i. AC 120-73, Damage Tolerance Assessment of Repairs to Pressurized Fuselages*

3. Other Documents referred to in this AC:

a. A Final Report of the AAWG – Continued Airworthiness of Structural Repairs*
b. A Report of the AAWG – Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Airplane Fleet*
c. A Report of the AAWG - Recommendations For Regulatory Action To Enhance Continued Airworthiness Of Supplemental Type Certificates*
d. Repair Assessment Guidelines, FAA Approved Model Specific Guideline Documents**
e. FAA Approved Model Specific Supplemental Inspection Documents**
f. ATA Report 51-93-01***
g. ATA Response to FAA Docket 1999-5401 Dated May 5, 2003***
h. Federal Register/Vol. 69, No. 146/Friday, July 30, 2004/Rules and Regulations Fuel Tank Safety Compliance Extension (Final Rule) and Aging Airplane Program Update (Request for Comments). Page 45936*

** Various manufacturers publish these documents. Please contact those manufacturers to determine the general availability of the documents.

*** Please contact the ATA.

APPENDIX 2. DEFINITIONS AND ACRONYMS

a. Supplemental Structural Inspection Program (SSIP) is a damage-tolerance-based inspection program. SSIPs only address the structure identified by the type certificate holder using the guidance contained in AC 91-56.

b. Instructions for Continued Airworthiness (ICA) are maintenance actions defined by the TC or STC holder and delivered with the airplane in accordance with 14 CFR 25.1529. ICA are documented information that includes the applicable methods, inspections, processes, procedures and airworthiness limitations.

c. Airworthiness Limitations Section (ALS) is a collection of mandatory maintenance actions required for airplane structure and fuel tank system. For structural maintenance actions, the ALS includes structural replacement times, structural inspection intervals, and related structural inspection procedures.

d. Repair Assessment Program (RAP) is a program that incorporates damage tolerance based inspections for repairs to the fuselage pressure boundary structure into the operators FAA approved maintenance and/or inspection program as required by 14 CFR 121.370.

e. Design Approval Holder (DAH) is a person that holds a type design approval for an airplane or any FAA approved data necessary to repair, alter, or modify airplane structure.

f. Type Design consists of drawings and specifications; information on dimensions, materials, and processes; airworthiness limitations; and any other data necessary to describe the design of the product.

g. Damage Tolerance Evaluation (DTE) a process that leads to a determination of continuing airworthiness inspections and other procedures for a repair using damage tolerance procedures as defined in AC 25.571-1, 1A, 1B, or 1C.

h. Damage Tolerance Inspections (DTI) inspections and other procedures that are a result of a DTE process. These should include the location of the airplane structure to be inspected, and the threshold and interval associated with those inspections, inspection method, and/or, in some cases, removal limits.

i. DT data refers collectively to the DTE processes and DTI needed by an operator to address repairs as required by the AASFR.

j. Repair is the restoration of an item to a serviceable condition in conformity with an approved standard.

k. Airplane structural configuration is the approved original type certificate design,_including any model variations or derivatives; and alterations or replacements mandated by AD.

l. Structures Task Group (STG) is a model specific group. The STG comprises design approval holders and operators who are responsible for the development of aging airplane mod specific programs. It also includes regulatory authorities who approve and monitor those programs.

m. Alteration or modification is an FAA-approved design change that is made to an airplane. Within the context of this AC these terms are considered synonymous. Both terms are purposely used herein to be all inclusive of any design change and to avoid potential misinterpretation of intent of these terms.

n. Amended Type Certificate (ATC) is a process where the original OEM may modify the airplane and have the modification approved by amending the original type certificate under 14 CFR 21. 177.

o. Design Service Goal (DSG) is the period of time (in flight cycles/hours) established at design and/or certification during which the principal structure will be reasonably free from significant cracking.

p. Repair Assessment Guidelines (RAG) a document that provides a means to establish a damage tolerance based inspection program for repairs to detect damage that may develop in a repaired area before that damage degrades the load carrying capability of a structure below the levels required by the applicable airworthiness standards.

APPENDIX 3. BACKGROUND

a. Fatigue is recognized as a significant threat to the continued airworthiness of airplanes. This is because even small fatigue cracks can significantly reduce the strength of the structure they are in. Consistent with this the airworthiness standards for certification of new transport category airplanes have always addressed fatigue with the intent of avoiding catastrophic failures because of fatigue throughout the operational life of the airplane. However these requirements have not remained unchanged. They have evolved over-time as the relevant knowledge base has increased because of service experience, specific incidents and accidents that have occurred and technological advances in design, analysis, testing, manufacturing, and inspection.

b. One of the first significant changes in the standards occurred in March 1956 with revision of the Fatigue Evaluation requirements contained in CAR 4b.270 to add “Fail-safe strength” as an option to the “Fatigue strength” approach for addressing fatigue. Motivation for this change was the realization that precluding fatigue cracking from occurring might not always be possible and therefore, as an option, the structure may be designed to survive cracking even if it occurred. The fatigue strength approach tries to achieve a design where fatigue cracking is not probable within the operational life of the airplane. The fail-safe approach assumed that cracking could occur while maintaining a specified minimum strength after a “fatigue failure or obvious partial failure” had occurred. The efficacy of the fail-safe approach was not only dependent on the structure keeping the specified minimum strength with the fatigue damage present but also on the finding the damage during normal maintenance. As applied, the fail-safe approach emphasis is on redundancy as opposed to fatigue performance while inspectability is assumed and not quantified. The fail-safe option was the predominate approach chosen for the most large transport category airplanes certified in the 1960s and 1970’s.

c. Another significant change in the airworthiness standards for fatigue occurred in October 1978 with amendment 25-45 with revision and deletion of §§ 25.571 and 25.573 of 14 CFR Part 25 respectively. This change involved removing the fail-safe option entirely and establishing a new requirement to develop damage tolerance based inspections wherever practical. The fatigue strength approach, as a default option, is used only if the damage tolerance approach is impractical. The motivation for the 1978 change is a recognition, based on mounting evidence, the fail-safe approach applied up to that point is not reliable and will not achieve the desired level of safety. Specific areas of concern with the fail-safe approach included the loss of fail-safety with age. This is because of the increased probability of cracking in the structure adjacent to the fatigue failure or obvious partial failure and the lack of directed inspections and quantification of residual life with the assumed damage present. It was agreed at the time that more emphasis is needed on where and how fatigue cracking could occur in the structure and on quantifying crack growth and residual strength characteristics. This includes damage tolerance characteristics and development of effective inspection protocols such as where, when, how and how often to inspect. The 1978 changes achieved this for new transport category airplane certification.

d. The same events and reasoning that drove the changes to airworthiness standards for new airplane also influenced the strategy adopted to ensure the continued airworthiness of the existing fleet. There was increasing concern about existing older airplanes certified according to the fail-safe requirements of CAR 4b.270. Eleven large transport models were specifically identified as needing the most attention. It was decided to develop damage tolerance based inspection programs and implement them for these airplanes. These inspections supplement existing maintenance inspections and thus these programs were referred to as Supplemental Structural Inspection Programs (SSIPs). The inspection requirements were documented in Supplemental Inspection Documents (SIDs). It was also agreed that SIDs would be developed by the Original Equipment Manufacturers on a voluntary basis and then mandated by Airworthiness Directive (AD). The CAA published guidance for developing the SSIPs in Airworthiness Notice No. 89, Continuing Structural Integrity of Transport Aeroplanes dated August 23, 1978 and by the FAA in Advisory Circular No. 91-56, Supplemental Structural Inspection Program for Large Transport Category Airplanes dated May 6, 1981. Subsequently SSIPs were developed and mandated by AD for the eleven aging models. Little or no consideration was given to repairs, alterations or modifications (RAMs). Airworthiness Directives that mandated the SSIP programs addressed some RAMs.

e. In April 1988 one of the eleven aging models, for which a SSIP had been developed and mandated by AD, suffered major structural damage to its pressurized fuselage structure because of undetected fatigue cracking of the baseline primary structure. This accident was attributed in part to the aging of the airplane involved. It precipitated actions culminating regulations aimed at avoiding catastrophic failures from fatigue in existing and future airplanes.

f. In response to the April 1988 accident the FAA sponsored a conference on aging airplane a establishing a task force representing the interests of the airplane operators, airplane manufacturers, regulatory authorities and other aviation representatives. In addition, other recommendations from this task force specifically recommended consideration of damage tolerance for repairs. In direct response to these recommendations changes to parts 91, 121, 125 and 129 of Title 14 of the CFR occurred in April 2000. This required operators to incorporate damage tolerance based inspections for existing and future repairs to the fuselage pressure boundary for the eleven aging models previously identified. This did not address other models and repairs to other structure.

g. The April 1988 accident also precipitated congressional legislation. In October 1991 Congress enacted Title IV of Public Law 102-143, the “Aging Airplane Safety Act of 1991” (AASA). Two key elements of the AASFR are as follows:

(1) Required "the Administrator to make such inspections and conduct such reviews of maintenance and other records of each airplane used by an air carrier to provide air transportation as may be necessary to determine that such is in a safe condition and is properly maintained for operation in air transportation".

(2) Specified that an air carrier must be able to demonstrate as part of the inspection "that maintenance of the airplane's structure, skin, and other age sensitive parts and components have been adequate and timely enough to ensure the highest level of safety".

h. Although the AASA did not define specifics of what had to be done, the one clear intent was to avoid catastrophic failures because of fatigue throughout the operational life of each affected airplane. Consistent with this, and the damage tolerance requirements adopted in 1978 for new transport category airplanes, FAA initiated rulemaking that would require broader implementation of damage tolerance based structural inspection programs. This would apply to almost all multiengine airplanes used in scheduled passenger service. Additionally the intent was to address all structure where fatigue cracking could result in catastrophic failure.

i. In response to the AASA, the FAA rulemaking efforts eventually resulted in the issuance of the Aging Airplane Safety Interim Final Rule (AASIFR) on December 6, 2002. This rule required implementation of damage tolerance based inspection programs for all airplanes operated under 14 CFR 121 and 129 operations. Also all multi-engine airplanes engaged in 129 or 135 operations that were initially certificated with 10 or more passenger seats by December 8, 2007. Airplanes operated between any point within the State of Alaska and any other point within the State of Alaska is exempt.

j. The AASIFR was subsequently amended and finalized on February 2, 2005, to the Aging Airplane Safety Final Rule (AASFR). The revised rule requires implementation of damage tolerance based inspection programs by December 20, 2010. This applies to airplanes engaged in 121 or 129 operations with type certificated seating capacity of 30 or more or a payload capacity of 7,500 pounds or greater. Airplanes operated within Alaska remain exempt. Although the scope has been reduced, it still affects the majority of airplanes engaged in scheduled passenger carrying service. Relative to damage tolerance based inspection programs it raises the level of safety on the existing fleet of affected airplanes to the same level required for current transport category airplane type design approvals.

APPENDIX 4. APPROVAL PROCESS FOR NEW REPAIRS

In the past, AC 1529-1 allowed a two-stage approach in approving repairs to PSEs. The two-stage approach consisted of:

- Type design strength requirements of section 25.305 before return to service
- Damage tolerance evaluation performed and DT data developed to demonstrate compliance with section 25.571 within 12 months of return to service.

The guidance material in AC 1529-1 is now embodied in this guidance material and modified to allow a three-stage approach now commonly used in the industry.

The DT data includes inspection requirements (i.e. inspection threshold, inspection method and inspection repeat interval) or other procedures (e.g. replacement/modification time) if inspections are shown to be impractical. The required data may be submitted all at once, prior to the airplane return to service, or it may be submitted in stages. The following three-stage approval process is available that involves incremental approval of engineering data to allow an airplane to return to service before all the engineering data previously described is submitted. The three stages are described as follows:

a. The first stage is approval of the static strength data and the schedule for submittal of the DT data. This approval is required prior to returning an airplane to service. The submittal of the DT data should generally occur prior to 12 months from when the airplane was returned to service.

b. The second stage is approval of the DT data. The DT data should be submitted in accordance with the schedule approved in the first stage. The DT data might only contain the threshold where inspections are required to begin as long as the operator can demonstrate that a process is in place to acquire the required inspection technique and interval before the threshold is reached. In this case the submittal and approval of the remaining DT data may be deferred to the third stage.

c. The third stage is approval of the DT data not submitted and approved in the second stage. This would typically involve the inspection method and the repeat intervals. This data would need to be submitted and approved prior to the inspection threshold being reached. Operation beyond the threshold would not be allowed unless the data is submitted and approval obtained.

APPENDIX 5. ASSESSMENT OF EXISTING REPAIRS

A DTI assessment process consists of the following steps:

a. Airplane Repair Survey. A survey will be used to identify existing repairs and repair configurations on fatigue critical structure and provide a means to categorize those repairs. The survey would apply to all affected airplanes, as defined in the implementation plan, in an operator's fleet using the process contained in the Compliance Document. The procedure to identify repairs that require DTE should be developed and documented in the Compliance Document using 14 CFR 25.571 and AC 25.571-1x (dependant on airplane certification level) together with additional guidance specific to repairs, such as:

- **(1)** Size of the repair
- **(2)** Repair configuration
  - **(a)** SRM standards
  - **(b)** Other
- **(3)** Proximity to other repairs
- **(4)** Potential affect on fatigue critical baseline structure
  - **(a)** Inspectability (access and method)
  - **(b)** Load distribution

b. Identification and Disposition of repairs requiring immediate action. Certain repairs may not meet minimum requirements based on its condition such as cracking, corrosion, dents, or inadequate design. Use the guidance provided in the Compliance Document to identify these repairs and once identified take appropriate corrective action. In some cases, modifications may need to be made before further flight. The operator should consider establishing a fleet campaign if such repairs may have been installed on other airplanes. Note: Additional FAA Certificate Maintenance Office (CMO) coordination and approval, or regulatory action may be required in these cases.

c. DTI Development. This includes the development of the appropriate maintenance plan for the repair under consideration. During this step determine the inspection method, threshold and repeat interval. Determine this information from existing guidance information as documented in the Compliance Document, or from the results of an individual damage tolerance evaluation performed in according to AC 25.571. Then determine the feasibility of an inspection program to maintain continued airworthiness. If the inspection program is practical, incorporate the DTI into the individual airplane maintenance program. If the inspection is either impractical or impossible, incorporate a replacement time for the repair into the individual airplane maintenance program. The three-stage approach discussed in Appendix 4 may be used if appropriate.

APPENDIX 6. REPAIRS TO REMOVABLE STRUCTURAL COMPONENTS

This Appendix provides guidance on handling DT data development and implementation for existing and new repairs to fatigue critical structure on removable structural components. In summary, the guidance covers:

- Methods of determining or assigning the age (hours/cycles) to a removable structural component when its original life history is unknown.
- Guidance on tracking of removable components that contain fatigue critical structure.
- Methods and schedules for developing and implementing DT data for repairs to removable components that contain fatigue critical structure.
- Implementation options for removable components that contain fatigue critical structure.

Other methods than those given below for determining the age of a component or tracking parts may be used if approved by the PMI as part of the Operator's Implementation Plan.

a. Determining the Age of a Component. Determining an actual component age or assigning a conservative age will provide flexibility and reduce operator burden when implementing DT data for repairs to structural components. In some cases, the actual component age may be determined from records. If the actual age cannot be determined this way, the component age may be conservatively assigned using one of the following fleet leader concepts depending upon the origin of the component:

(1) If part times are not available, but records indicate that <u>no</u> part changes have occurred, airplane cycles/hours can be used.

(2) If no records are available and the parts could have been switched from one or more older airplanes under the same maintenance program, it should be assumed that the time on any part is equal to the oldest airplane in the program. If this is unknown, the time should be assumed equal to the same model airplane that is the oldest or has the most hours/flight cycles in the world fleet.

(3) A manufacturing date marked on a component may also be used to establish the component's age. This can be done by using the above reasoning and comparing it to airplanes in the affected fleet with the same or older manufacturing date.

If none of these options can be used to determine or assign a component age or hours/cycles, a conservative implementation schedule can be applied in Paragraph c, below, for the initial inspection if required by the DT data.

b. Tracking. An effective, formal control or tracking system should be established for removable structural components that are subject to this rule. This will help ensure compliance with maintenance program requirements specific to repairs installed on an affected removable structural component. Paragraph d, below, does provide options that could be used to alleviate some of the burdens associated with tracking all repairs to affected removable structural components.

c. Developing and Implementing DT Data:

(1) Existing Repairs – Components Installed prior to December 20, 2010. Accomplish the initial repair assessment of the affected component at the same time as the airplane level survey for the airplane on which the component is installed (Step b, above). Develop the DT data per the process given in Step 3 of Appendix 5 and incorporate the DTI into the maintenance program. Accomplish the first inspection on the affected component according to the following schedule:

(a) If the actual repair installation age, hours/cycles is known, use that to accomplish the first inspection against the component. Repeat inspect at the intervals given for the repair.

(b) If the repair installation age, hours/cycles is unknown, but the component age, hours/cycles is known or can be assigned conservatively, use the component age, hours/cycles to accomplish the first inspection against the component. Repeat inspect at the intervals given for the repair against the component.

(c) As an option, accomplish the first inspection on the affected component at the next C-check (or equivalent interval) following the repair assessment. Repeat inspect at the intervals given for the repair against the component.

(2) Existing Repairs – Components Installed from Storage after December 20, 2010. For components installed from storage after December 20, 2010 that have not previously had DTE performed and DTI implemented, develop and implement DT data as follows:

(a) If the time on the component (hours/cycles) is known, or can be conservatively assigned, perform the following:

- **i** Survey the component,
- **ii** Disposition the repair(s)
- **iii** Implement the DTI in accordance with the schedule given for an airplane in Chapter 207 b(1), using the component's age
- **iv** Accomplish the first inspection using the actual repair age, hours/cycles if known. If the repair age is not known, use the component age. Repeat inspect at the intervals given for the repair against the component.

(b) If the time on the component, hours/cycles is unknown and cannot be assigned, accomplish the initial repair assessment of the affected component prior to installation.

i Develop the DT data per the process given in Chapter 207 b(1).

ii Incorporate the DTI into the maintenance program.

iii Accomplish the first inspection on the affected component at the next C-check (or equivalent interval) following the repair assessment.

iv Repeat inspect at the intervals given for the repair against the component.

(3) New Repairs. New repairs to fatigue critical structure on removable structural components installed beginning December 21, 2010, and thereafter, must have DTE performed and DTI implemented according to the process described in Appendix 4, “Approval Process for New Repairs”. The initial and repeat inspections are accomplished at the intervals given for the repair against the component.

d. Implementation Options to Help Reduce Tracking Burden. The following implementation techniques could be used to alleviate some of the burdens associated with tracking repairs to affected removable structural components. These techniques, if used, would need to be included in the Operator’s Implementation Plan(s) and may require additional FAA-ACO approval and DAH input for DTI.

(1) Upgrading Existing Repairs. As an option, existing repairs may be removed and replaced to zero time the DTI requirements of the repair and establish an initial tracking point for the repair. Normally, this would be done at or before the survey for maximum benefit. The initial and repeat inspections for the upgraded repair would then be accomplished at the intervals given for the repair against the component.

A repair could also be upgraded to one whose inspection requirements and methods are already fulfilled by an Operator’s regular FAA-approved maintenance or inspection program (Section 302, Step d., Implementation Techniques). That repair would then be repetitively inspected at each routine inspection interval applicable to the repair. Specific tracking would not be required because that area of the airplane would already be normally inspected on each airplane in the fleet as part of the existing approved maintenance program. If the Operator’s program intervals were changed, the affect on requirements for specific tracking would have to be re-evaluated.

(2) Special Initial and/or Routine Inspections. As an option, existing repairs may have special initial inspections accomplished during the survey to zero time the DTI requirements of the repair and establish an initial tracking point for the repair.

In addition, special routine inspections could be defined for typical repairs that could be applied at a normal interval. In this case, an operator could check the affected components on each aircraft for this type of a repair at the defined interval. If the repair were found, the special inspection would be applied to ensure its airworthiness until the next scheduled check. This would alleviate the need to specifically track affected components for every repair, especially typical ones.

The development of inspection processes, methods, applicability and intervals would most likely require the assistance of the DAH for the fatigue critical structure in question. In all circumstances, the data must be approved by the FAA-ACO.

APPENDIX 7. PROGRAM IMPLEMENTATION EXAMPLES

The following are provided to assist the operator in understanding how the program should be implemented. Two examples are given, one covers airplanes below 75% DSG on December 18, 2009, and the other is for airplanes beyond DSG on December 18, 2009.

a. Airplane Below 75% DSG on December 18, 2009

Consider the following:

(1) Airplane Total Cycles on December 18, 2010 – 55,000
(2) DSG = 75,000 Cycles, 75% DSG – 56,250 Cycles
(3) Time of last “D”-Check Equivalent – 53,000 Cycles
(4) 8 Year “D”- check Equivalent – 360 Days/Year, 4 cycles/day = 11,680 Cycles

The survey would be performed after the airplane reaches 56,250 cycles and would be due before 64,680 cycles, but in any case would be required before the airplane reached 75,000 cycles.

b. Airplane Beyond DSG on December 18, 2009

Consider an airplane that has accumulated 80,000 cycles as of December 18, 2009, a DSG of 75,000 cycles. The airplane is currently on an 8 year “D” check equivalent and the last “D”-check was performed in January 2009 at 78,540 cycles. The survey would need to be performed prior to the airplane accumulating 90,220 cycles or 6 years whichever occurs sooner, based on the airplane utilization of 4 cycles/day, a 360-day year, and a maximum accumulated cycles of 81,460 as of December 20, 2010.

Appendix C: AAWG Recommendations on AC 91-56B

U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

AAWG ANNOTATED VERSION – Includes AAWG Recommendations from ARAC Tasking Review

Subject: CONTINUING STRUCTURAL INTEGRITY PROGRAM FOR AIRPLANES	**Date: XX/XX/02** **Initiated By: ANM-115**	**AC No: 91-56B** **Change:**

1. PURPOSE. This Advisory Circular (AC) provides guidance material to type certificate holders (TCH) and operators for use in developing a continuing structural integrity program to ensure safe operation of older airplanes throughout their operational life.

2. CANCELLATION. AC 91-56A, Continuing Structural Integrity Program for Large Transport Category Airplanes dated April 29, 1998, is canceled.

3. RELATED REGULATIONS AND DOCUMENTS.

a. Title 14 of the Code of Federal Regulations (14 CFR):

(1) Part 25, § 25.571.

(2) Part 91, § 91.403.

(3) Part 43, § 43.16.

AAWG Changes Highlighted:
Additions shown in *Italics*
Deletions shown in ~~Strikethrough~~

(4) Part 121, §121.368, §121.370, and §121.370(a).

(5) Part 129, §129.16, §129.32, and §129.33.

b. Advisory Circulars (AC):

(1) AC 25.571-1, Damage Tolerance and Fatigue Evaluation of Structure.

(2) AC 91-60, The Continued Airworthiness of Older Airplanes.

(3) AC 120-73, Damage Tolerance Assessment of Repairs to Pressurized Fuselages.

(4) AC 120-AAWG, Damage Tolerance Inspections for Repairs.

4. DEFINITIONS. Terms included in this document are defined as follows:

a. Supplemental Structural Inspection Program (SSIP).

(1) This guidance material is traditionally applied to the eleven large transport airplane models (Airbus Model A300; British Aerospace BAC 1-11; Boeing Models B-707/720, B-727, B-737, B-747; McDonnell Douglas DC-8, DC-9/MD-80, DC-10; Fokker F28; and Lockheed Model L-1011 series 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 takeoff gross weight greater than 75,000 pounds operated under Subpart D of 14 CFR Parts 91, 121, and 125.

(2) The promulgation of the “Aging Airplane Safety” rule expanded the requirement for damage tolerance-based SSIPs beyond the above noted eleven models to include:

- All airplanes operated under Subpart D of 14 CFR Part 121;
- All U.S.-registered multiengine airplanes operated under 14 CFR Part 129 certificated with 10 or more passenger seats; and
- All multiengine airplanes used in scheduled operations under 14 CFR Part 135 certificated with 10 or more passenger seats.

(3) Guidance material for all U.S.-registered multiengine airplanes operated under Part 129 certificated with 9 or less passenger seats and all multiengine airplanes operated under Part 135 certificated with 9 or less passenger seats required by the “Aging Airplane Safety” rule to develop a service history based SSIPs is provided in AC 91-60.

b. Mandatory Modification Program. This guidance material is applicable to the eleven large transport airplane models (Airbus Model A300; British Aerospace BAC 1-11; Boeing Models B-707/720, B-727, B-737, B-747; McDonnell Douglas DC-8, DC-9/MD-80, DC-10; Fokker F28; and Lockheed Model L-1011 series airplanes) that are required by airworthiness directives to modify or replace aging structures with known cracking problems.

c. Corrosion Prevention and Control Program (CPCP). This guidance material is applicable to the airplanes that are required by airworthiness directives (AD) to maintain the corrosion on their airplanes to an acceptable level.

d. Repair Assessment Program. This guidance material is applicable to the eleven large transport airplane models (Airbus Model A300; British Aerospace BAC 1-11; Boeing Models B-707/720, B-727, B-737, B-747; McDonnell Douglas DC-8, DC-9/MD-80, DC-10; Fokker F28; and Lockheed Model L-1011 series airplanes) that are required by operational rules to incorporate repair assessment guidelines for the fuselage pressure boundary in their FAA-approved maintenance or inspection program.

NOTE: The "Evaluation for Widespread Fatigue Damage" will be mandated in a future rulemaking activity.

5. BACKGROUND.

a. 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 factors such 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.

b. The Federal Aviation Administration (FAA), TCH, and operators are continually working 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 airplanes indicate the need for a program to ensure a high level of structural integrity for all airplanes. Accordingly, the inspection and evaluation programs outlined in this AC are intended to ensure a continuing structural integrity assessment by each airplane TCH and the incorporation of the results of each assessment into the maintenance program of each operator.

6. SUPPLEMENTAL STRUCTURAL INSPECTION PROGRAMS.

a. Initiation and Implementation. The TCH, in conjunction with operators, is expected to initiate development of a SSIP 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.

b. Timeline to Begin Initiation. The SSIP should be accomplished in accordance with the timeline provided in the "Aging Airplane Safety" rule. 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 Structural Inspection Document (SSID) should be developed, as outlined in Appendix 1, from this body of data.

c. Submission of the SSID. 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 SSID and presented in a manner that is effective. The SSID should include:

(1) The type of damage being considered;

(2) Likely sites;

(3) Inspection access;

(4) Threshold;

(5) Interval;

(6) Method and procedures;

(7) Applicable modification status and/or life limitation; and

(8) Types of operations for which the SSID is valid.

d. FAA Review and SSID Acceptance. The FAA review of the SSID will include both engineering and maintenance aspects of the proposal. Since the SSID is applicable to all operators and is intended to address potential safety concerns on older airplanes, it will be made mandatory under the existing AD system or in accordance with the "Aging Airplane Safety" rule. In addition, any service bulletin or other service information publications found to be essential for safety during the initial SSID 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 SSID should be added to the SSID or implemented by separate AD action, as appropriate.

NOTE: In the event an acceptable SSID cannot be obtained on a timely basis, the FAA may impose service life, operational, or inspection limitations to ensure structural integrity.

e. SSID Revisions. The TCH should revise the SSID whenever additional information shows a need. The original SSID 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 SSID criteria and the basis for these revisions should be submitted to the FAA for review and approval of both engineering and maintenance aspects.

f. Baseline Structure Inspection Program. The operators will be expected to accomplish a damage tolerance based inspection program of all *alterations, modifications and repairs made to aircraft structure and STCs that is susceptible to fatigue cracking that could contribute to a catastrophic failure. This is to be done in accordance with the timelines established in the "Aging Airplane Safety" rule.* ~~major repairs, alterations, or modifications to baseline structure in accordance with the timelines established in the "Aging Airplane Safety" rule.~~ The baseline structure is defined as that airplane structure that was originally built by the TCH. The results must be presented to the cognizant Aircraft Certification Office for review and approval, with type certificate responsibility for the airplane model being considered. Traditionally, the ADs that have mandated SSIPs on older airplanes have addressed repairs, alterations, and modifications that affect principal structural elements (PSE) and the "Repair Assessment for Pressurized Fuselages" rule addressed repairs to the fuselage pressure boundary (fuselage skin, door skin, and bulkhead webs), but the "Aging Airplane Safety" rule requires that all *alterations, modifications and repairs made to aircraft structure and STCs that are susceptible to fatigue cracking that could contribute to catastrophic failure be considered.* ~~major repairs, alterations, and modifications to baseline structure be considered.~~

7. MANDATORY MODIFICATION PROGRAM.

a. 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:

- The likelihood that known structural cracking problems exist and are not just theoretical or predicted.
- The consequences of failing to correct the problem must be catastrophic. This means that the structural element involved must be a PSE or other primary structure.
- The cracks must be difficult to detect during regular maintenance.
- Other considerations are that the areas to inspect are difficult to access, nondestructive testing (NDT) methods are unsuitable, or human factors of inspection are so adverse that crack detection may not be sufficiently dependable to assure safety.

b. The structural modification programs were invoked 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 DC-8, DC-9/MD-80, DC-10; Fokker F28; and Lockheed Model L-1011 series airplanes) by ADs. Each of the TCHs reviewed their service bulletins with the FAA to determine which areas of structure needed terminating modifications to inspections. The revised service bulletins that included those terminating modifications were then grouped in a document and mandated, or the service bulletin was mandated individually.

c. *The Aging Airplane Safety Final Rule requires that all modifications that are susceptible to fatigue cracking that could contribute to a catastrophic failure be considered.*

8. CORROSION PREVENTION AND CONTROL PROGRAM (CPCP). A CPCP is a systematic approach to controlling corrosion in the airplane's primary structure and consists of a basic corrosion inspection task, task areas, defined corrosion levels, and compliance times. The objective of a CPCP is to limit the material loss due to corrosion to a level necessary to maintain airworthiness.

a. The CPCPs were mandated by ADs 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 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 an AD. These corrosion programs supplemented each operator's maintenance program.

b. The corrosion programs were developed based on the premise that operators could 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.

c. *Include a new paragraph that stipulates industry standard practices since CPCP rulemaking withdrawn (TBD).* ~~The FAA is considering additional rulemaking to require that maintenance or inspection programs for all airplanes operated under Part 121, all U.S.-registered multiengine airplanes operated in common carriage by foreign air carriers or foreign persons under Part 129 and all multiengine airplanes used in scheduled operations operated under Part 135 include an FAA-approved CPCP. This Notice of Proposed Rulemaking (NPRM) would give operators two years to implement a CPCP into their maintenance or inspection program. This NPRM would be issued in response to the Aging Airplane Safety Act of 1991.~~

9. REPAIR ASSESSMENT PROGRAM. The industry was given the task 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 repairs do not deteriorate due to accidental, fatigue, or environmental damage beyond FAA-approved levels for the remaining usage life of the airplane.

a. On January 2, 1998, an NPRM, Repair Assessment for Pressurized Fuselages, was published in the Federal Register. The proposed rule would prohibit 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 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. This rulemaking ensures that a comprehensive damage tolerance repair assessment be completed for fuselage pressure boundary repairs.

b. The final rule was published in the Federal Register on April 25, 2000 and became effective May 25, 2000. As a result of this final rule the new operating rules are Part 91, § 91.410, Part 121, § 121.370, Part 125, § 125.248, and Part 129, § 129.32. AC 120-73 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.

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 that are 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 SSID 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. SSIDs for the above noted aging aircraft models and those derivatives that were not certified to the damage tolerance requirements will still continue to be mandated by airworthiness directives. SSIDs for the other airplanes will be incorporated in accordance with the “Aging Airplane Safety” rule and will not require airworthiness directives. ADs issued as a result of a WFD finding that require structural modification would be handled separately. In all cases, compliance will be required in accordance with the applicable regulations.

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

APPENDIX 1

GUIDELINES FOR DEVELOPMENT OF THE SUPPLEMENTAL STRUCTURAL INSPECTION DOCUMENT

1. GENERAL.

a. The airplanes subject to this appendix 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 Title 14 of the Code of Federal Regulations (14 CFR) Part 25, § 25.571. An acceptable means of compliance can be found in the current version of AC 25.571-1, Damage Tolerance and Fatigue Evaluation of Structure.

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, alterations and modifications approved by the TCH and made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, should be considered.* ~~major repairs, alterations and modifications approved by the TCH should be considered.~~ In addition, it will be necessary to consider the effect of all *repairs and operator or STC-approved alterations and modifications on individual airplanes, which are made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.* ~~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. 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 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: If an inspection procedure is not reliable or practicable, then replacement or modification of the structure 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 (SSID) 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 SSID, 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 SSID (added as revision to the initial SSID);

(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; and

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

c. The SSID 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 SSID.

6. STRUCTURAL REPAIRS, ALTERATIONS AND MODIFICATIONS

a. Operators are responsible for ensuring that an assessment is made of all *repairs, alterations and modifications (e.g. STCs) to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure,* ~~major repairs, alterations and modifications (e.g., STCs) to baseline structure~~ to develop a damage tolerance based inspection program that ensures the same confidence as the baseline structure. The baseline structure is defined as that airplane structure that was originally built by the TCH. The operator will need to conduct an assessment on each of their airplanes to determine what repairs, alterations and modifications are applicable for a damage tolerance assessment.

b. Reliance on the operator's baseline maintenance program may be critical elements of the TCH evaluation to develop the SSID. *Repairs, alterations and modifications made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure,* ~~Major repairs, alterations and modifications~~ may invalidate these maintenance programs and would require additional analysis and/or testing.

c. Operators must accomplish a damage tolerance assessment for all new repairs, alterations and modifications to *aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.* ~~baseline structure.~~

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, Title 14 of the Code of Federal Regulations (14 CFR) Part 25, § 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 WFD. 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.

Appendix D: ARAC Recommendations on WFD

The following Draft NPRM was submitted to ARAC on May 23, 2001, and represents the AAWG recommendations for rulemaking on the subject of WFD.

[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 enrooted 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:

- *Multiple site damage (MSD) 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).*
- *Multiple element damage (MED) 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*

> ***NOTE**: 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 Federal Register.*

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.*

2. *Because of the instances of MSD/MED in the fleet and the continued reliance on surveillance types of inspections to discover such damage, develop rules and advisory material that will provide specific programs, including a structural audit, to preclude WFD in the fleet.*

3. *Implement an effective aging airplane program, including a Mandatory Modifications Program, Corrosion Prevention and Control Program (CPCP), Repair Assessment Program (RAP), and a Supplemental Structural Inspection Program (SSIP) or Airworthiness Limitations Section (ALS) as a necessary prerequisite for effective program to address MSD/MED.*

4. *Use a monitoring period for the management of potential MSD/MED scenarios in the fleet, if the structural audit determines that MSD/MED cracking is detectable before the structure loses its required residual strength.*

5. Carefully consider any program established to correct MSD or MED in the fleet to ensure that the necessary lead times to develop resources to implement fleet action are addressed. For example, operators need time to assess their fleet and accomplish a structural audit of repaired, altered or modified structure that is susceptible to MSD or MED.

The FAA tasked the Technical Oversight Group re: Aging Aircraft (TOGAA) to review and comment on the WFD Report. TOGAA endorsed the AAWG methodology on January 10, 2000.

In December 1999, a new task was assigned to ARAC entitled "Task 6: Aging Aircraft Program (Widespread Fatigue Damage - WFD)." In the tasking, the FAA requested that ARAC develop recommendations for operating rules and a revision to § 25.1529, Appendix H, to implement an aging aircraft program that would include a program to preclude WFD from the fleet. ARAC assigned this task to the AAWG. This proposed rule and proposed AC 91-56B (discussed later) are based on the recommendations submitted by ARAC to the FAA in response to this tasking.

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 Final 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:

<u>Section 25.571(b)</u> 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 that 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:

<u>Operational Rule 1 – Basis of Structural Maintenance Program</u>

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. <u>Acceptable mandatory modifications programs</u> 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. <u>An acceptable CPCP</u> 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, and 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. <u>An acceptable SSIP</u> 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. <u>An acceptable RAP</u> 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 Final 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 would 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.

<u>Operational Rule 2 – Aging Aircraft Program</u>

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

<u>First</u>, 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 include 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 fatigue critical 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 inspect able using visual means to being unimpeachable. 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 fatigue critical 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. <u>Detection-Related Benefits</u>: 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 <u>accident-related benefits</u> 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.

<u>Costs</u>

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 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 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 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 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 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 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

Appendix E: AAWG Recommendations to TAEIG Concerning Proposed Follow-on Task 2, 3 and 4 Activities

The following is a proposal for the follow activities that were defined in the report.

Background:

In the Federal Register / Vol. 69, No. 93 / Thursday, May 13, 2004 / Notices Aviation Rulemaking Advisory Committee; Transport Airplane and Engine Issues—New Task, Page 26641, The FAA assigned ARAC a new task to develop guidance that will support industry compliance with the Aging Airplane Safety Final Rule requirements that relate to supplemental structural inspections. ARAC assigned this tasking to the Airworthiness Assurance Working Group (AAWG). In Task 2 and 3 of the subject tasking, the AAWG was to write a report to include a proposed action plan for addressing recommendations from Tasks 2 and 3 (the best means to incorporate damage tolerance based inspections and procedures for alterations and modifications and developing widespread fatigue damage maintenance requirements for repairs, alterations and modifications). The report was to include a proposed action plan to address or accomplish these recommendations. This action plan would be submitted to the TAEIG who would determine, as appropriate, the means by which the action plan be implemented. In addition, the AAWG will support the 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. The AAWG is also responsible for the oversight of the STG activities for development of the compliance data according to AC 120-AAWG as amended by any follow-on guidance material from this Tasking.

Task 4 is a combination of follow-on activities from Task 2 and 3 combined with the specific Task 4 activities.

Task 2 Proposed Action Plan for Follow-on Activities– Damage Tolerance Based Inspections And Procedures For Alterations And Modifications.

The AAWG determined that additional specific guidance material was necessary for the industry to uniformly develop DT data for previously installed Alterations and Modifications. Specifics of that recommendation are included in Section 3 of this report. The AAWG requests that the TAEIG task the following to the AAWG:

1. The AAWG will prepare and submit guidance materials for consideration of alterations and modifications to the TAEIG within six months of TAEIG acceptance of the written report.
2. Upon TAEIG acceptance of the AAWG guidance material, the AAWG will recommend that Model Specific STGs invite STC DAH and involve them in the dialog to ensure that DT data is in existence on December 18, 2009 for all commonly embodied STCs in concert with Task 4 of the original tasking.

Task 3 Proposed Action Plan – Widespread Fatigue Damage of Repairs Alterations and Modifications

The AAWG determined that additional specific guidance material was necessary for the industry to uniformly develop WFD data for previously installed Repairs, Alterations and Modifications. Specifics of that recommendation are included in Section 4 of this report. The AAWG requests that the TAEIG task the following to the AAWG:

The AAWG will develop and provide additional guidance data for the development of WFD data for repairs and provide it to ARAC within 6 months of TAEIG acceptance of this proposal. The AAWG will then establish a group of technical experts that will develop the required technical basis for the guidance material. They will then develop that material for inclusion in either FAA Advisory Circular 120-AAWG or another yet to be determined AC. This guidance material should include:

1. Screening process to identify significant repairs, alterations, and modifications. The guidance material should contain a means to screen repairs, alterations, and modifications to determine which ones would be of a potential concern for development of WFD.
2. Invitation to significant STC holders to participate in the STG. An invitation should be extended to those DAHs who hold the certification data for repairs, alterations, and modifications identified in step one. Their participation in the STG will be of great assistance in developing the required data.
3. Developing means to acquire data for significant repairs, alterations, and modifications where the DAHs are not in a position to supply the data. There will be some repairs, alterations, and modifications where the DAH is unavailable to develop the data. The STG should develop a plan whereby the data is developed.
4. There may be other actions that could be considered to assist the operators in developing the data.

TASK 4 PROPOSED ACTION PLAN – MODEL SPECIFIC PROGRAMS

The following actions will be taken by the AAWG upon acceptance of the findings of this report by TAEIG.

1. The AAWG will list the STGs currently in existence and will identify those airplane models that do not have an STG

2. Assess the need to form an STG on a model specific basis (based on industry benefit).

3. 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.

4. The AAWG will support the 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.

Schedule

All recommendations for additional guidance material under Task 2 and 3 must be complete and submitted to ARAC no later than six months after TAEIG Acceptance of the findings in this report.

The Structures Task Groups, under the direction of the ARAC, should produce the model specific guidance material, Task 4, using the guidelines and procedures of the AC produced in Phase 1. The ARAC will be responsible for coordinating and overseeing the STG's application of the AC. Phase 2 documents should be completed by December 18, 2009.

Working Group Activity

The Airworthiness Assurance Working Group must comply with the procedures adopted by ARAC. This normally requires the following elements:

1. Recommend a work plan for completion of the task, including the rationale supporting such a plan for consideration at the next meeting of the ARAC on transport airplane and engine issues held following publication of this notice.

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

3. Draft the appropriate documents and required analyses and/or any other related materials or documents.

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

Whereas this is an oversight activity, items 1, 2 and 3 will not be required. However status reports on the progress of the STGs in developing compliance documents and data will be required at each meeting of the ARAC held to consider transport airplane and engine issues.

Appendix F: AAWG Meetings and Attendance Records

1. Meeting Dates and Venues

AAWG Meetings

July 23, 2003	--	Atlanta Georgia (Delta Air Lines)
June 30, 2004	--	Long Beach CA (FAA)
March 1, 2005	--	Miami FL (Airbus)
October 26, 2005	--	Memphis TN (FedEx)

Task Group Meetings

Ad-hoc Task Planning Group		
September 15-17, 2003	–	Seattle Washington (Boeing)
November 11-14, 2003	–	London England (British Airways)
March 29-April 2, 2004	–	Toulouse France (Airbus)
May 17-21, 2004	–	Memphis Tennessee (FedEx)
Task Group Meetings		
July 12-16, 2004	–	Gatwick England (CAA-UK)
September 20-21, 2004	–	Long Beach (Boeing)
November 15-19, 2004	–	Brussels Belgium (FAA)
January 31- Feb 4, 2005	–	Miami FL (Airbus)
March 14-18, 2005	–	Hamburg GE (Airbus)
May 2-6, 2005	–	Long Beach CA (FAA/Boeing)
June 13-19, 2005	–	Collioure FR (Airbus)
September 26-30, 2005	–	Seattle WA (Boeing)

2. **AAWG Organizational Meeting Attendance**

	MEETING DATE			
Organization	**July 2003**	**June 2004**	**March 2005**	**October 2005**
Airborne Express (M)	X	X	X	X
Airbus (M)	X	X	X	X
ALPA				
America West				
American Airlines (M)	X	X		X
ATA (M)				X
Boeing (M)	X	X	X	X
British Aerospace (M)	X			
British Airways (M)	X	X		X
CAA-UK(JAA) (M)	X			
Continental Airlines (M)	X	X	X	X
Delta Air Lines (M)	X	X		
Evergreen Aviation				
FAA (M)	X	X	X	X
Federal Express (M)	X	X	X	X
Fokker Services				
IATA				
Japan Air Lines		X		
Lockheed (M)	X			
Northwest Airlines (M)		X	X	X
SIE		X		
TIMCO		X		
United Airlines (M)	X	X	X	
UPS (M)	X	X	X	X
US Airways (M)	X	X		X

(M) – AAWG Voting Member

3. AAWG Task Planning Group Organizational Attendance

	MEETING DATES			
Organization	**Sep 2003**	**Nov 2003**	**Mar 2004**	**May 2004**
Airborne Express	X	X		X
Airbus	X	X	X	X
American Airlines	X	X	X	X
ATA				
Boeing	X	X	X	X
British Airways	X	X	X	X
Continental Air Lines	X	X	X	X
Delta Air Lines	X	X	X	X
EASA		X	X	
FAA	X	X	X	X
Federal Express	X	X		X
Gulfstream		X	X	
Japan Air Lines	X	X	X	X
Lockheed			X	X
Northwest Airlines	X	X	X	X
SIE				
TIMCO				
United Airlines	X			
UPS	X	X		X
US Airways	X	X	X	X

4. **AAWG Task Group Organizational Attendance**

	MEETING NUMBER							
Organization	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Airborne Express		X		X		X		
Airbus	X	X	X	X	X	X	X	X
American Airlines	X		X	X	X	X	X	
ATA								
Boeing	X	X	X	X	X	X	X	X
British Airways	X	X	X	X	X		X	X
Continental Air Lines								
Delta Air Lines	X	X						
EASA	X	X	X	X				
FAA	X	X	X	X	X	X	X	X
Federal Express	X	X	X	X		X	X	X
Gulfstream								
Japan Air Lines	X	X		X				X
Lockheed								
Northwest Airlines	X	X	X	X	X	X	X	X
SIE						X		
TIMCO								
Transport Canada								X
United Airlines								
UPS	X	X	X	X	X	X	X	X
US Airways	X	X						

No.	Date	Venue
1	July 12-16, 2004	Gatwick England (CAA-UK)
2	September 20-21, 2004	Long Beach (Boeing)
3	November 15-19, 2004	Brussels Belgium (FAA)
4	January 31- Feb 4, 2005	Miami FL (Airbus)
5	March 14-18, 2005	Hamburg GE (Airbus)
6	May 2-6, 2005	Long Beach CA (FAA/Boeing)
7	June 13-19, 2005	Collioure FR (Airbus)
8	September 26-30,2005	Seattle WA (Boeing)

U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject:	CONTINUING STRUCTURAL INTEGRITY PROGRAM FOR LARGE TRANSPORT CATEGORY AIRPLANES	Date: 5/23/01 Initiated by: ANM-110	AC No: 91-56BX Change: DRAFT 5

1. PURPOSE.

a. This Advisory Circular (AC) describes an acceptable means for showing compliance with various requirements of Title 14, Code of Federal Regulations, that concern establishing a program to address widespread fatigue damage (WFD) in transport category airplanes. This AC provides guidance to type certificate holders 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, including provision to preclude WFD. This guidance material applies to large transport airplanes that:

- were certificated under the fail-safe and fatigue requirements of Civil Air Regulations (CAR) 4b or 14 CFR part 25 (except for the "Supplemental Inspection Program" which is applicable to airplanes certified to pre-amendment 25-45);
- have a maximum gross takeoff weight greater than 75,000 pounds; and
- are operated under 14 CFR parts 91, 121, 125, 129, or 135.

b. The means of compliance described in this document provides guidance to supplement the engineering and operational judgment that must form the basis of any compliance findings relative to continuing structural integrity programs for large transport category airplanes

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

d. Like all advisory circular material, this AC is not, in itself, mandatory, and does not constitute a regulation. It describes an acceptable means, but not the only means, for showing compliance with the requirements for transport category airplanes. Terms such as "shall" and "must" are used only in the sense of ensuring applicability of this particular method of compliance when the acceptable method of compliance described in this document is used. While these guidelines are not mandatory, they are derived from extensive Federal Aviation Administration and industry experience in determining compliance with the relevant regulations.

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

2. **CANCELLATION.** Advisory Circular (AC) 91-56A, Continuing Structural Integrity Program for Large Transport Category Airplanes, dated April 29, 1998, is canceled.

3. **RELATED REGULATIONS AND DOCUMENTS.**

a. **Title 14, Code of Federal Regulations (CFR):**

§ 25.571	Damage-tolerance and fatigue evaluation of structure
§ 25.903	Engines
§ 25.1529	Instructions for Continued Airworthiness
§ 43.16	Airworthiness Limitations
§ 91.403	Maintenance, Preventive Maintenance, and Alterations - General

b. **FAA Advisory Circulars (AC)**

AC 91-60" "	The Continued Airworthiness of Older Airplanes, dated June 13, 1983.
AC 20-128A"	Design Considerations for Minimizing Hazards Caused by Uncontained Turbine Engine and Auxiliary Power Unit Rotor Failure", dated March 25, 1997.

c. **Related Documents**

"Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Airplane Fleet," Revision A, dated June 29, 1999 [A report of the Airworthiness Assurance Working Group for the Aviation Rulemaking Advisory Committee Transport Aircraft and Engine Issues.]

4. **BACKGROUND.**

a. Service experience has shown there is a need to have continuing updated knowledge on the structural integrity of transport airplanes, especially as they became older. The structural integrity of these airplanes is of concern because such factors as fatigue cracking and corrosion are time-dependent, and our knowledge about them can best be assessed based on real-time operational experience and the use of the most modern tools of analysis and testing.

b. The Federal Aviation Administration (FAA), type certificate holders, and operators have continually worked to maintain the structural integrity of older airplanes. Traditionally, this has been carried out 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 use, 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 AC 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.

5. DEFINITIONS AND ACRONYMS.

a. For the purposes of this AC, the following definitions apply:

(1) **Damage-tolerance** is the attribute of the structure that permits it to retain its required residual strength without detrimental structural deformation for a period of use after the structure has sustained a given level of fatigue, corrosion, and accidental or discrete source damage.

(2) **Design Service Goal (DSG)** is the period of time (in flight cycles/hours) established at design and/or certification during which the principal structure will be reasonably free from significant cracking including widespread fatigue damage.

(3) **Extended Service Goal (ESG)** is an adjustment to the design service goal established by service experience, analysis, and/or test during which the principal structure will be reasonably free from significant cracking including widespread fatigue damage.

(4) **Principal Structural Element (PSE)** is an element that contributes significantly to the carrying of flight, ground or pressurization loads, and whose integrity is essential in maintaining the overall structural integrity of the airplane.

(5) **Widespread Fatigue Damage (WFD)** in a structure 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 (i.e., to maintain its required residual strength after partial structural failure).

(6) **Multiple Site Damage (MSD)** is a source of widespread fatigue damage characterized by the simultaneous presence of fatigue cracks in the same structural element (i.e., fatigue cracks that may coalesce with or without other damage leading to a loss of required residual strength).

(7) **Multiple Element Damage (MED)** is a source of widespread fatigue damage characterized by the simultaneous presence of fatigue cracks in similar adjacent structural elements.

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

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
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
LOV	Limit of Validity
LDC	Large Damage Capability
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

SMP	Structural Modification Point
SSID	Supplemental Structural Inspection Document
SSIP	Supplemental Structural Inspection Program

6. **SUPPLEMENTAL STRUCTURAL INSPECTION PROGRAMS.** The type certificate holder (TCH), in conjunction with operators, is expected to initiate the development of a Supplemental Structural Inspection Program (SSIP) 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 Structural Inspection Document (SSID) should be developed, as outlined in Appendix 1 of this AC, from this body of data.

a. The recommended SSIP, 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 SSIP should be adequately defined in the SSID. The SSID 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 SSID is valid.

b. The FAA's review of the SSID will include both engineering and maintenance aspects of the proposal. Because the SSID is applicable to all operators and is intended to address potential safety concerns on older airplanes, the FAA will make it mandatory under the existing Airworthiness Directive (AD) system. In addition, the FAA will issue AD's to implement any service bulletins or other service information publications found to be essential for safety during the initial SSID assessment process. Service bulletins or other service information publications revised or issued as a result of in-service findings resulting from implementation of the SSID should be added to the SSID or will be implemented by separate AD action, as appropriate.

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

d. The TCH should revise the SSID whenever additional information shows a need. The original SSID 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 SSID criteria and the basis for these revisions should be submitted to the FAA for review and approval of both engineering and maintenance aspects.

7. MANDATORY MODIFICATION PROGRAM. [*Reserved*]

8. CORROSION PREVENTION AND CONTROL PROGRAM (CPCP). [*Reserved*]

9. REPAIR ASSESSMENT PROGRAM (RAP). [*Reserved*]

10. EVALUATION FOR WIDESPREAD FATIGUE DAMAGE.

a. The likelihood of the occurrence of fatigue damage in an airplane's structure increases with airplane usage. The design process generally establishes a design service goal (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. The SSIP described in paragraph 6. and Appendix 1 of this AC are intended to find this form of damage before it becomes critical.

b. 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 effect on the large damage capability (LDC) before the cracks become detectable. The development of cracks at multiple locations (both MSD and MED) may also 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.

c. The TCH, in conjunction with operators, and in some cases the operators themselves are expected to initiate development of a maintenance program with the intent of precluding operation with 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 when needed, development of the program should be initiated no later than the time when the highest-time or highest-cycle airplane in the fleet reaches three quarters of its DSG or the extended service goal (ESG).

d. The results of the WFD evaluation should be presented for review and approval to the cognizant FAA Aircraft Certification Office having type certificate responsibility for the airplane model being considered. Since the objective of this evaluation is to preclude WFD from the fleet, it is expected that the results will include recommendations for necessary inspections or modification and/or replacement of structure, as appropriate. It is expected that the TCH will work closely with operators in the development of these programs to assure that the expertise and resources are available when implemented.

e. The FAA's review of the WFD evaluation results will include both engineering and maintenance aspects of the proposal. Since WFD is a safety concern for all operators of older airplanes, identified inspection or modification and/or replacement programs are proposed to be made mandatory by operational rules applicable to 14 CFR parts 91, 121, 125, 129, and 135. 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.

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

g. It is expected that the original recommended actions stemming from a WFD evaluation will be focused on those structural items that are soon expected to reach a point at which MSD/MED is predicted to occur. As the fleet ages, more areas of the airplane may reach the life at which MSD/MED is predicted to occur in those details, and the recommended service 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.

h. Operators will be expected to accomplish a WFD evaluation of applicable modified, repaired, or altered structure. The results must be presented for review and approval to the cognizant FAA Aircraft Certification Office having type certificate responsibility for the airplane model being considered.

11. IMPLEMENTATION. Once the FAA issues a SSID AD, operators must amend their current structural inspection programs to comply with and account for the applicable AD. The program to preclude WFD in the fleet has been mandated by operational rules, which require operators to amend the current structural maintenance programs. Any AD's 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.

DRAFT

Manager, Transport Airplane Directorate
Aircraft Certification Service

APPENDIX 1

GUIDELINES FOR DEVELOPMENT OF THE SUPPLEMENTAL STRUCTURAL INSPECTION DOCUMENT

1. GENERAL.

a. This appendix to AC 91-56B applies to transport category airplanes that were certificated prior to amendment 25-45 of 14 CFR part 25. That amendment introduced § 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. An acceptable means of compliance can be found in AC 25.571-1C ("Damage-Tolerance and Fatigue Evaluation of Structure," dated April 29, 1998) or the latest revision.

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, if 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 non-destructive techniques, and the inspection of individual airplanes, involving partial or complete dismantling ("teardown") 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 determination should be based on study of 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 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 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 3.a., above, the following should be included for each critical part or component:

(1) the basis used 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, 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 2.c. The size of damage that 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 4.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 1.c. 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 4.c.(1), above, would apply.

5. THE SUPPLEMENTAL STRUCTURAL INSPECTION DOCUMENT.

a. The SSID 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 SSID, 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 SSID (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 SSID should be compared 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 SSID. Future structural service bulletins should state their effect on the SSID.

APPENDIX 2

GUIDELINES FOR THE DEVELOPMENT OF A PROGRAM TO PRECLUDE THE OCCURRENCE OF WIDESPREAD FATIGUE DAMAGE

1. DEFINITIONS

a. WFD (average behavior) is the point in time when 50% of the fleet is expected to reach WFD for a particular detail.

b. Inspection Start Point (ISP) is the point in time when special inspections of the fleet are initiated due to a specific probability of having a MSD/MED condition.

c. Structural Modification Point (SMP) is a point reduced from the WFD average behavior (i.e., lower bound), so that operation up to that point provides equivalent protection to that of a two-lifetime fatigue test. No airplane may be operated beyond the SMP without modification or part replacement.

d. Teardown is the destructive inspection of structure, using visual and non-destructive inspection technology, to characterize the extent of damage within a structure with regard to corrosion, fatigue, and accidental damage.

e. Large Damage Capability (LDC) is the ability of the structure to sustain damage visually detectable under an operator's normal maintenance that is caused by accidental damage, fatigue damage, and environmental degradation, and still maintain limit load capability with MSD to the extent expected at SMP.

f. Scatter Factor is a life reduction factor used in the interpretation of fatigue analysis and fatigue test results.

g. Test-to-Structure Factor is a series of factors used to adjust test results to full-scale structure. These factors could include, but are not limited to, differences in:

- stress spectrum,
- boundary conditions,
- specimen configuration,
- material differences,
- geometric considerations, and

- environmental effects.

2. GENERAL.

a. The likelihood of the occurrence of fatigue damage in an airplane's structure increases with airplane usage. The design process generally establishes a design service goal (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.

b. With extended usage, uniformly loaded structure may develop cracks in adjacent fastener holes, or in adjacent similar structural details. These cracks may or may not interact, and they can have an adverse effect on the large damage capability (LDC) of the structure before the cracks become detectable. The development of cracks at multiple locations (both MSD and MED) may also 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 the time of certification.

c. 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.

d. There is a distinct possibility that there could be a simultaneous occurrence of MSD and MED in a given structural area. This situation is possible on some details that were equally stressed. If this is possible, then this scenario should be considered in developing appropriate service actions for structural areas.

e. 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, Corrosion Prevention and Control Program, Supplemental Structural Inspection Program and Repair Assessment Program.

f. There are alternative methods for accomplishing a WFD assessment other than that given in this AC. For example, AC 25-571-1C Paragraph 6.C(4) or latest revision contains guidance material for the evaluation of structure using risk analysis techniques.

3. STRUCTURAL EVALUATION FOR WFD.

a. **General**. The evaluation has three objectives:

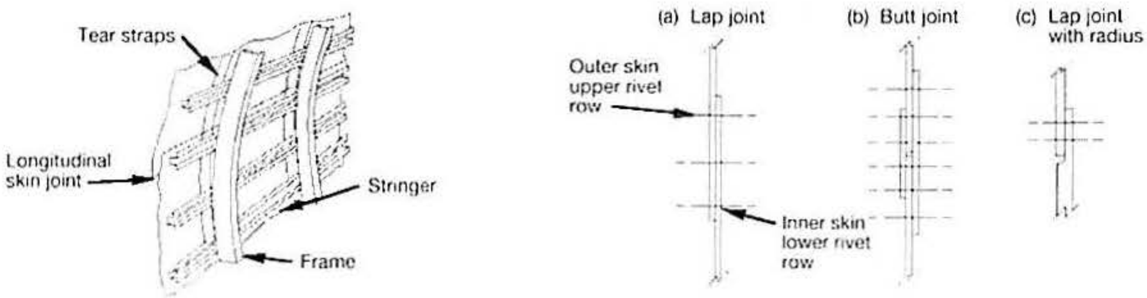
(1) Identify primary structure susceptible to MSD/MED (see paragraph 3.b of this appendix).

(2) Predict when it is likely to occur (see paragraph 3.c. of this appendix).

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

b. **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. The following list contains known types of structure susceptible to MSD/MED:

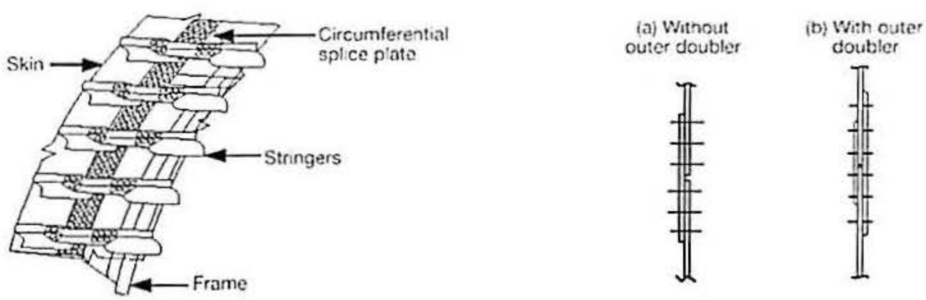
STRUCTURAL AREA	SEE FIGURE
Longitudinal Skin Joints, Frames, and Tear Straps (MSD/MED)	A2-1
Circumferential Joints and Stringers (MSD/MED)	A2-2
Lap joints with Milled, Chem-milled or Bonded Radius (MSD)	A2-3
Fuselage Frames (MED)	A2-4
Stringer to Frame Attachments (MED)	A2-5
Shear Clip End Fasteners on Shear Tied Fuselage Frames (MSD/MED)	A2-6
Aft Pressure Dome Outer Ring and Dome Web Splices (MSD/MED)	A2-7
Skin Splice at Aft Pressure Bulkhead (MSD)	A2-8
Abrupt Changes in Web or Skin Thickness — Pressurized or Unpressurized Structure (MSD/MED)	A2-9
Window Surround Structure (MSD, MED)	A2-10
Over Wing Fuselage Attachments (MED)	A2-11
Latches and Hinges of Non-plug Doors (MSD/MED)	A2-12



Type and possible location of MSD and MED
- MSD longitudinal skin joint
  - Lap joint
    - Outer skin upper rivet row
    - Inner skin lower rivet row
  - Butt joint
    - Skin outer rivet rows
    - Doubler inner rivet rows
  - Lap joint with radius
    - In radius
- MED—frame
  - Stress concentration areas
- MED—tear straps
  - Critical fastener rows in the skin at tear strap joint

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

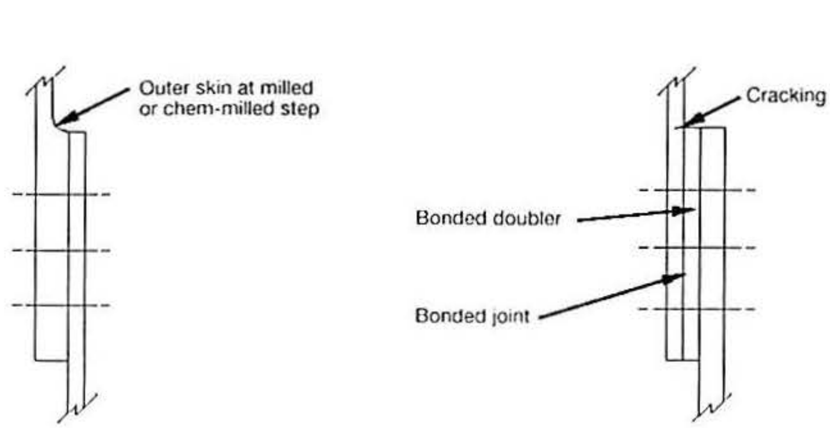
Figure A2-1 ***Longitudinal Skin Joints, Frames, and Tear Straps (MSD/MED)***



Type and possible location of MSD/MED
- MSD—circumferential joint
  - Without outer doubler
    - Splice plate—between and/or at the inner two rivet rows
    - Skin—forward and aft rivet row of splice plate
    - Skin—at first fastener of stringer coupling
  - With outer doubler
    - Skin—outer rivet rows
    - Splice plate/outer doubler—inner rivet rows
  - MED—stringer/stringer couplings
    - Stringer—at first fastener of stringer coupling
    - Stringer coupling—in splice plate area

Service or test experience of factors that influence MSD and/or MED (examples)
- High secondary bending
- High stress level in splice plate and joining stringers (misuse of data from coupon test)
- Poor design (wrong material)
- Underdesign (over-estimation of interference fit fasteners)

Figure A2-2 ***Circumferential Joints and Stringers (MSD/MED)***



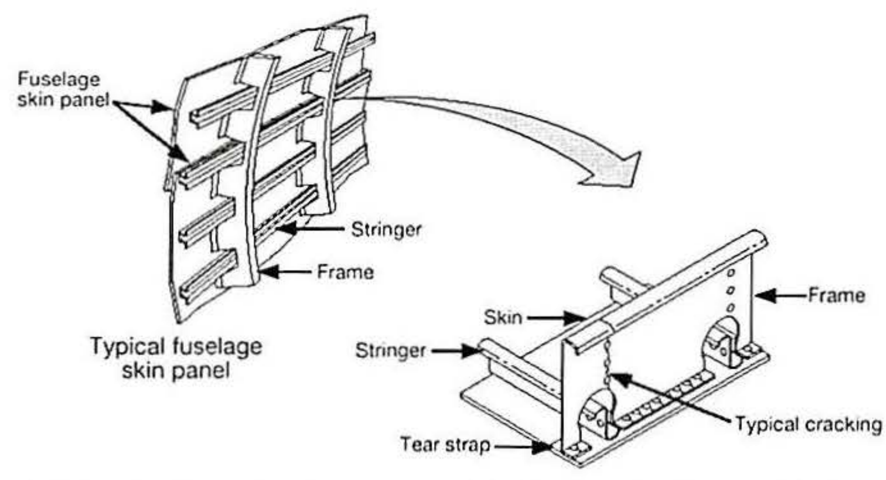
Type and possible location of MSD and MED

- MSD—abrupt cross section change
- Milled radius
- Chem-milled radius
- Bonded doubler runout

Service or test experience of factors that influence MSD and MED (examples)

- High bending stresses due to eccentricity

Figure A2-3 ***Lap joints with Milled, Chem-milled or Bonded Radius (MSD)***



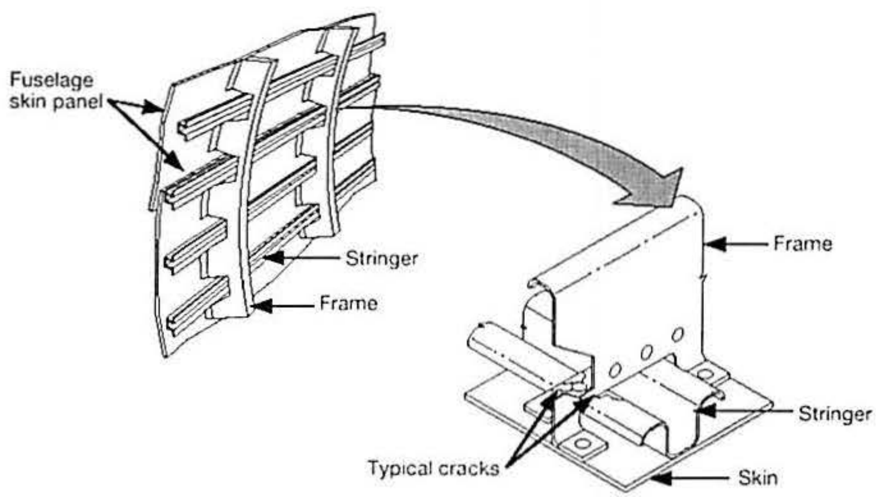
Type and possible location of MSD/MED

- 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

Figure A2-4 ***Fuselage Frames (MED)***



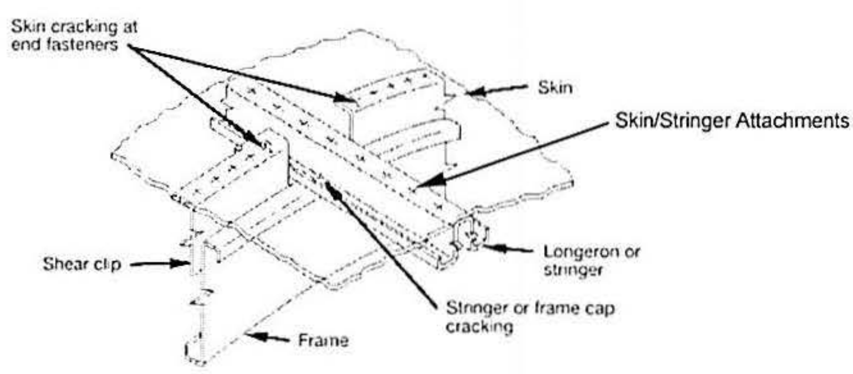
Type and possible location of MED

- MED—any combination of fracture of frames, clips, or stringers, including the attachments, resulting in the loss of the shear tie between the frame and stringer. This condition may occur at either circumferential or longitudinal locations at fuselage frame/stringer intersection.

Service or test experience of factors that influence MSD and/or MED (examples)

- Poor load path connection

Figure A2-5 ***Stringer to Frame Attachments (MED)***



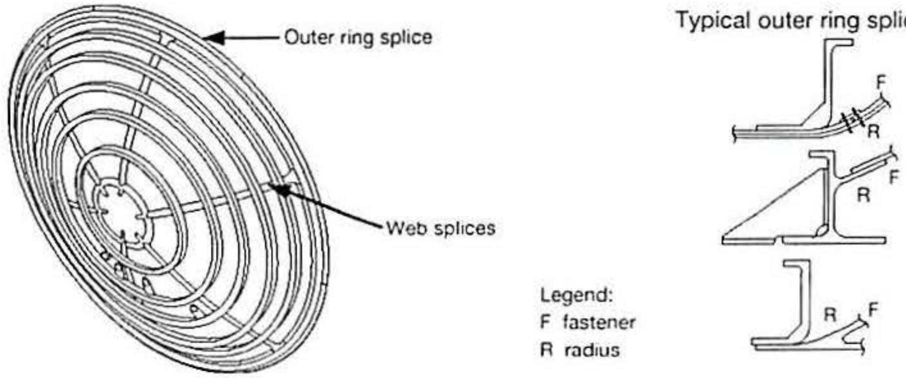
Type and possible location of MSD and MED

- 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

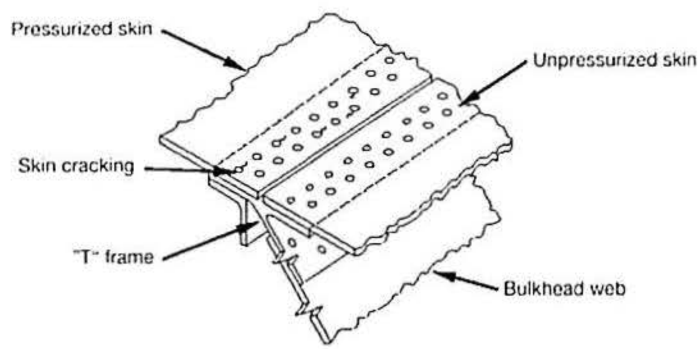
Figure A2-6 ***Shear Clip End Fasteners on Shear Tied Fuselage Frame (MSD/MED)***



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

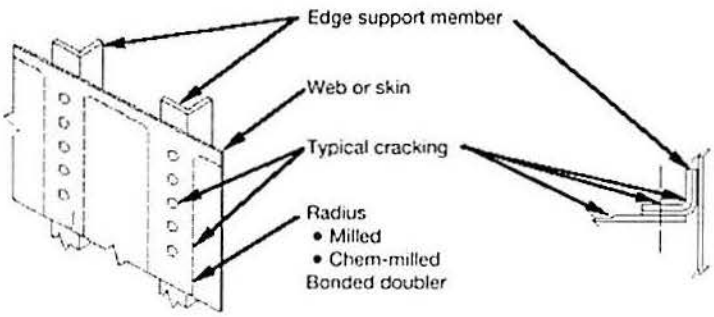
Figure A2-7 *Aft Pressure Dome Outer Ring and Dome Web Splices (MSD/MED)*



Type and possible location of MSD and MED
- MSD—skin at end fastener holes

Service or test experience of factors that influence MSD and MED (examples)
- Shell discontinuous induced bending stresses
- High load transfer at fastener

Figure A2-8 *Skin Splice at Aft Pressure Bulkhead (MSD)*



Type and possible location of MSD and MED

Abrupt change in stiffness*
- Milled radius
- Chem-milled radius
- Bonded doubler
- Fastener row at edge support members

Edge member support structure
- Edge member - in radius areas

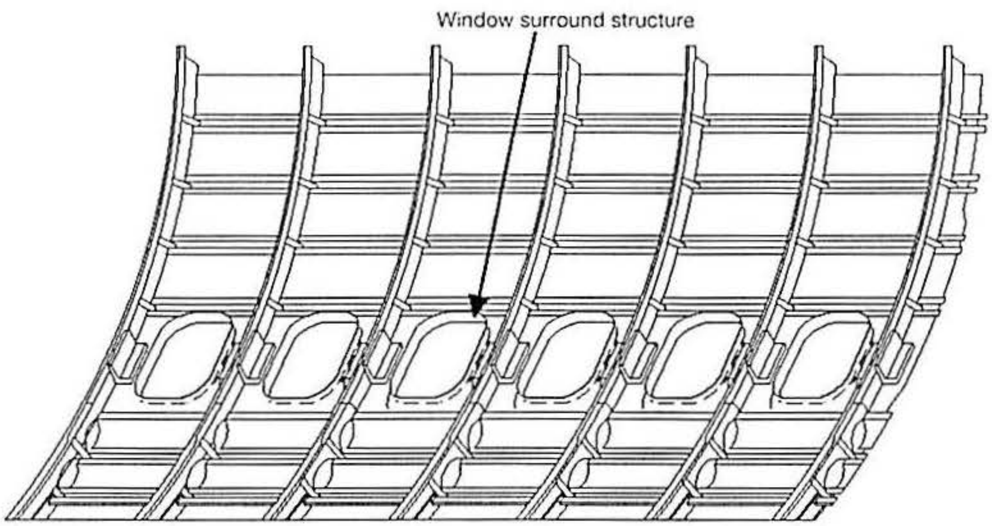
Service or test experience of factors that influence MSD and MED

Pressure structure
- High bending stresses at edge support due to pressure

Non-pressure structure
- Structural deflections cause high stresses at edge supports

* Often multiple origins along edge member

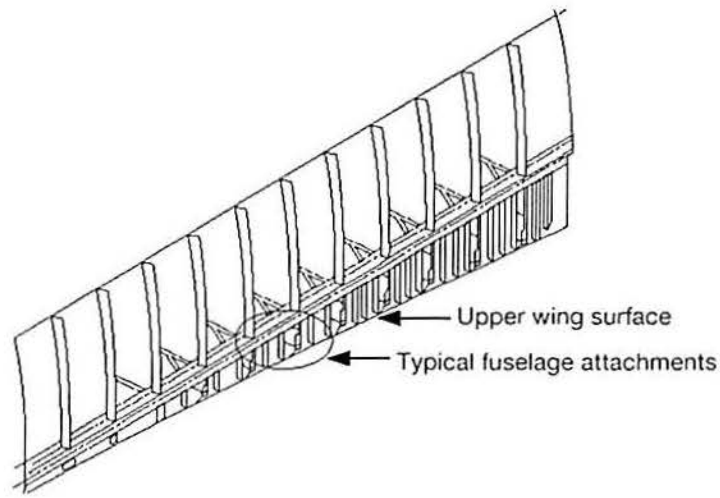
Figure A2-9 *Abrupt Changes in Web or Skin Thickness — Pressurized or Unpressurized Structure (MSD/MED)*



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

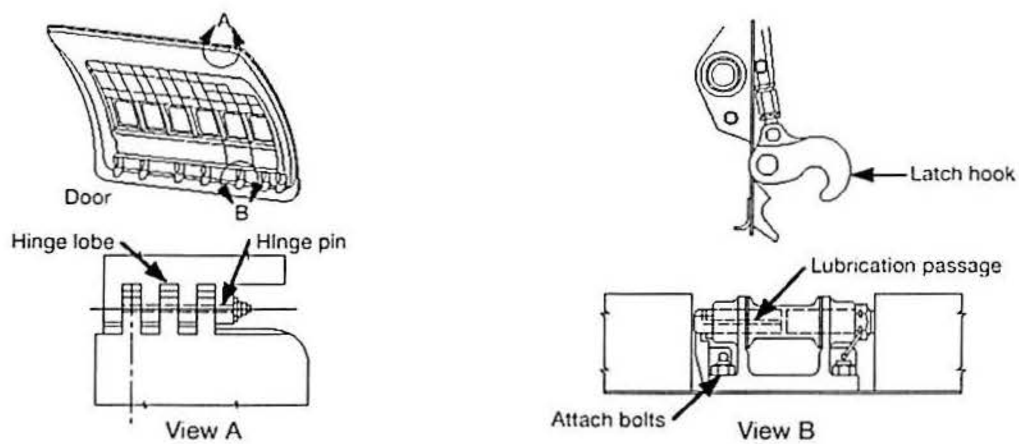
Figure A2-10 *Window Surround Structure (MSD, MED)*



Type and possible location of MSD/MED
- MED—repeated details in overwing fuselage attachments

Service or test experience of factors that influence MSD and/or MED (examples)
- Manufacturing defect—prestress
- Induced deflections

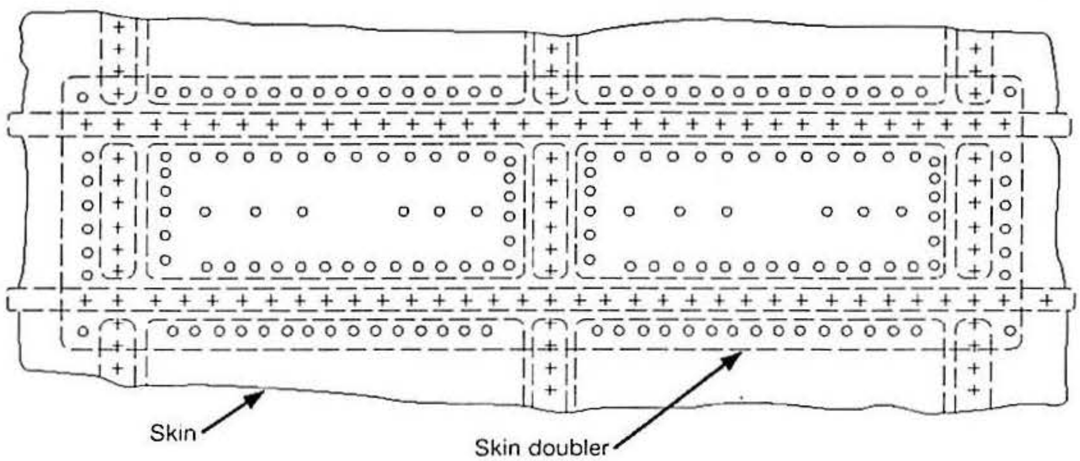
Figure A2-11 *Over Wing Fuselage Attachments (MED)*



Type and possible location of MSD/MED
- MSD—piano hinge
  - At hinge fastener attachment row
  - In fillet radius
  - Emanating from hole in lobes
- MED—latches
  - In multiple latch hooks
  - At lube channel of latch spool
  - At spool bracket attach bolts (also corrosion)

Service or test experience of factors that influence MSD and/or MED (examples)
- Bending stresses due to fuselage elongation
- High local stress
- Fretting

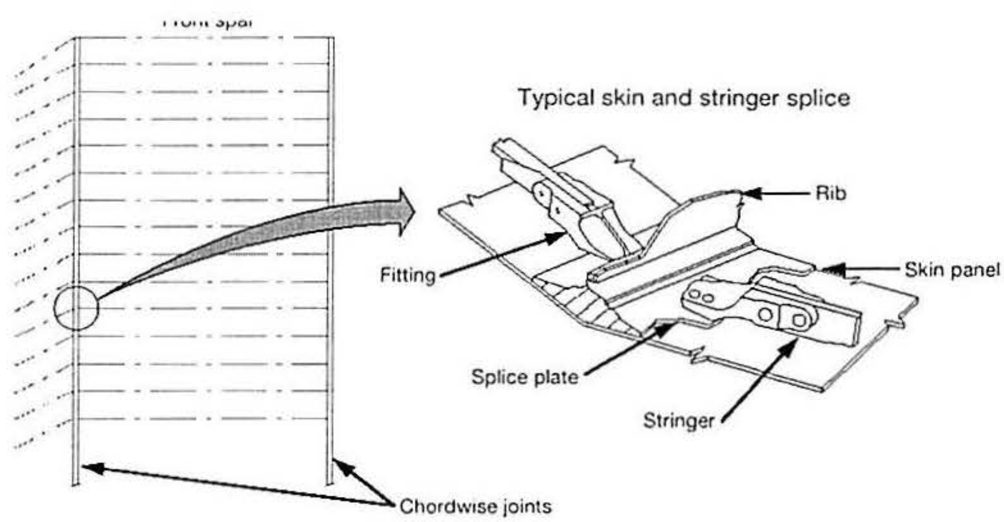
Figure A2-12 *Latches and Hinges of Non-plug Doors (MSD/MED)*



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

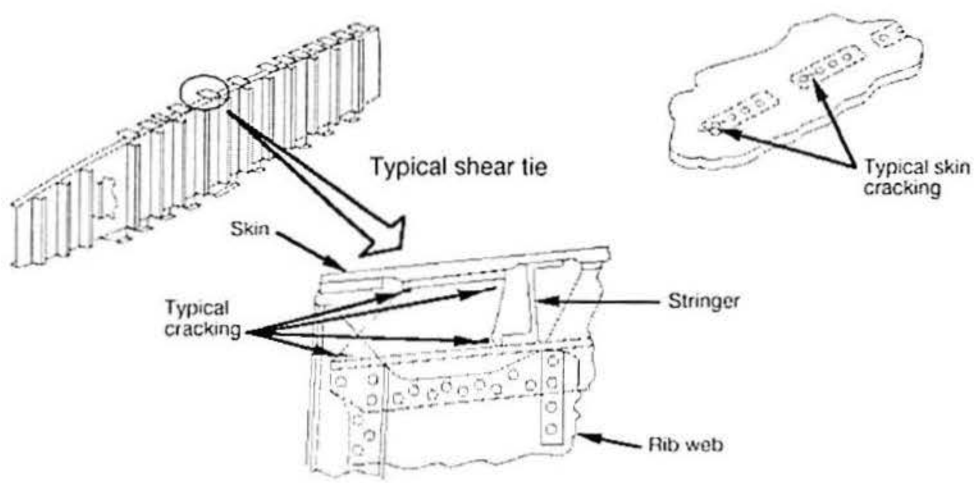
Figure A2-13 ***Skin at Runout of Large Doubler (MSD) — Fuselage, Wing or Empennage***



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

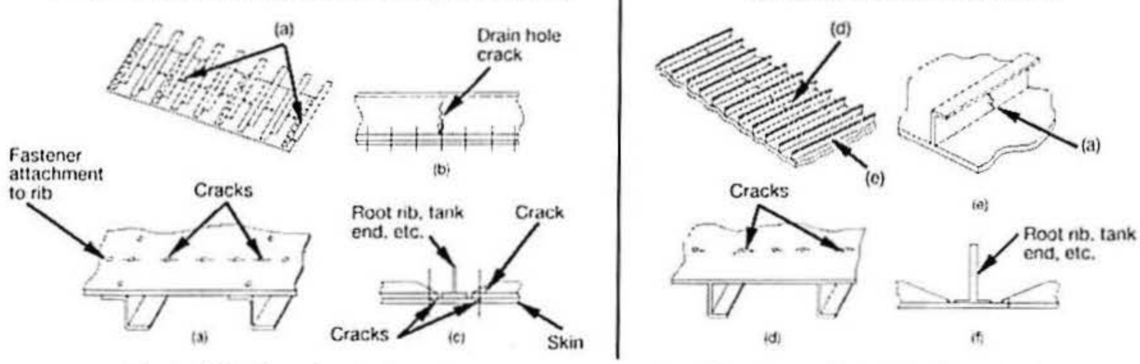
Figure A2-14 ***Wing or Empennage Chordwise Splices (MSD/MED)***



Type and possible location of MSD and MED
- MSD—critical fasteners in skin along rib attachments
- MED—critical rib feet in multiple stringer bays (particularly for empennage under sonic fatigue)

Service or test experience of factors that influence MSD and MED (examples)
- Manufacturing defect—prestress due to assembly sequence
- Sonic fatigue (empennage)

Figure A2-15 ***Rib to Skin Attachments (MSD/MED)***



Inherent fail safe and crack stopper characteristics
- MSD—chordwise cracks link up at
  - a) Rib attachment holes
- MED—
  - b) Drain or vent holes
  - c) Stiffener run-outs at root rib or tank end rib

Do not have inherent crack stopper characteristics of riveted skin and stringer construction
- MSD—Chordwise cracks link up at
  - d) Rib attachment holes
  - e) Drain or vent holes
  - f) Stringer run-outs at root rib or tank end rib
- MED—becomes MSD

Figure A2-16 ***Typical Wing and Empennage Construction (MSD/MED)***

c. **WFD Evaluation.** By the time the highest-time airplane of a particular model reaches its DSG, the evaluation for each area susceptible to the development of WFD should be completed. A typical evaluation process is shown in Figure A2-17. 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:

d. Determination of WFD average behavior in the fleet:

(1) The time in terms of flight cycles/hours to the WFD average behavior 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. If fatigue test evidence is used, Figure A2-18, relates how that data might be reduced in determining WFD Average Behavior. Evaluation may be analytically determined, supported by test or service evidence.

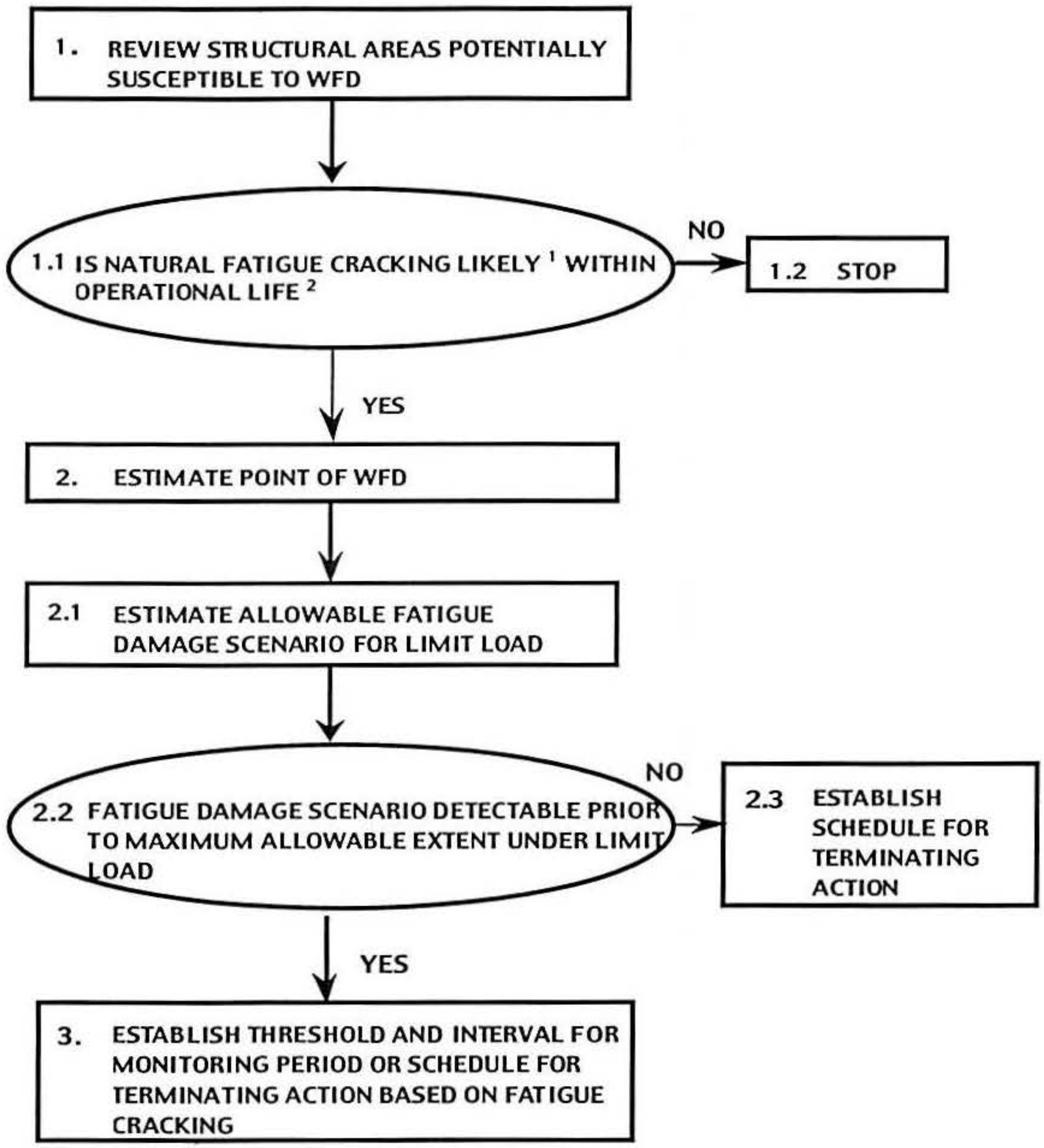
(2) Initial Crack/Damage Scenario: This is an estimate of the size and extent of multiple cracking expected at MSD/MED initiation. This prediction requires empirical data or an assumption of the crack/damage locations and sequence plus a fatigue evaluation to determine the time to MSD/MED initiation. Alternatively, analysis can be based on either:

- the distribution of equivalent initial flaws, as determined from the analytical assessment of flaws found during fatigue test and/or teardown inspections regressed to zero cycles; or
- a distribution of fatigue damage determined from relevant fatigue testing and/or service experience.

(3) Final Cracking Scenario: This is an 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. One such approach is to define the final cracking scenario as a sub-critical condition (e.g., first crack at link-up at limit load). Use of a

sub-critical scenario reduces the complexity of the analysis and, in many cases, will not greatly reduce the total crack growth time.

AIRPLANE EVALUATION PROCESS – STEP 1



NOTES

1. Fatigue cracking is defined as likely if the factored fatigue life is less than the projected ESG of the airplane at time of WFD evaluation.
2. The operational life is the projected ESG of the airplane at time of WFD evaluation.

Figure A2-17 *Airplane Evaluation Process, Part 1 of 2*

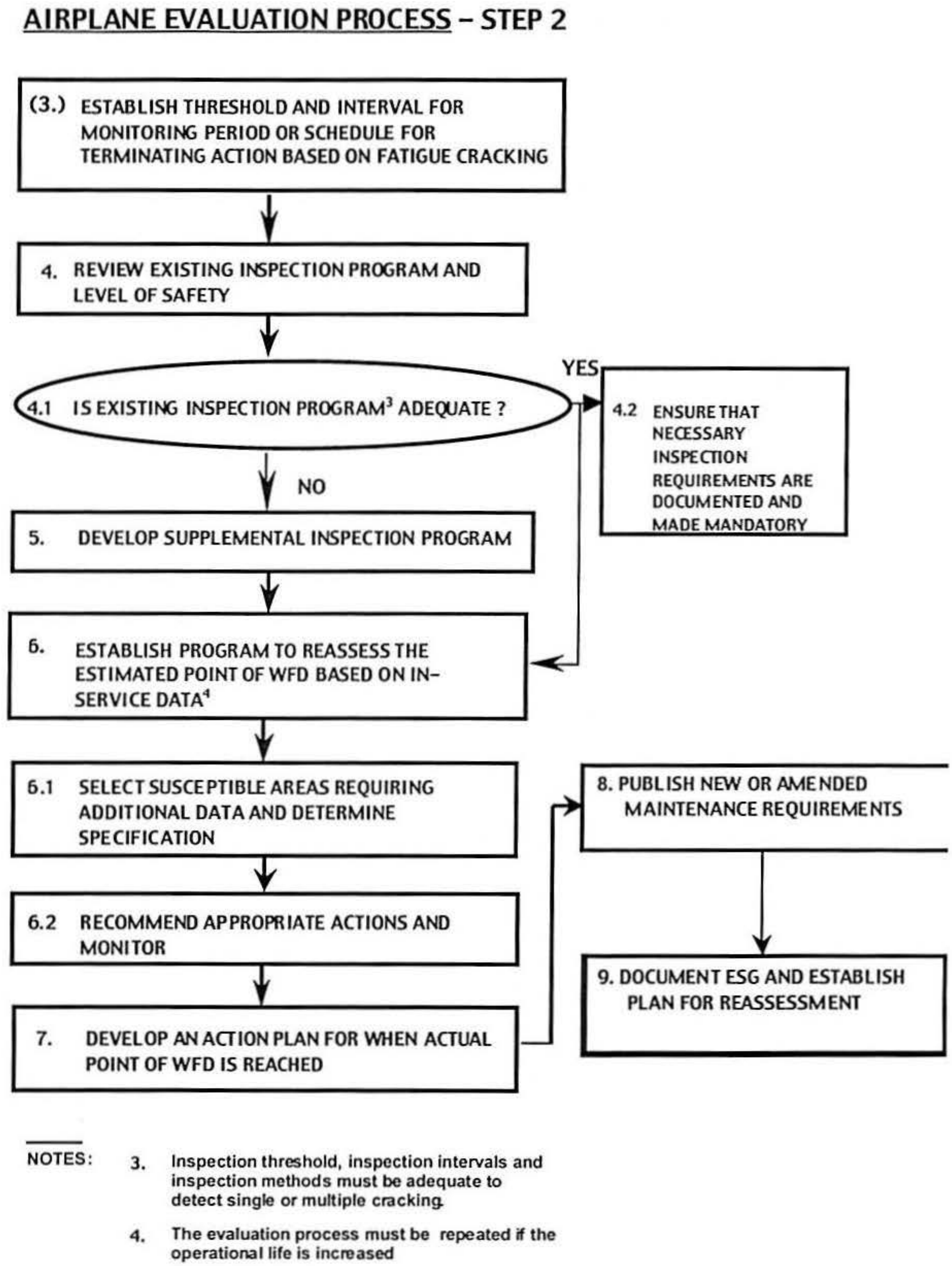
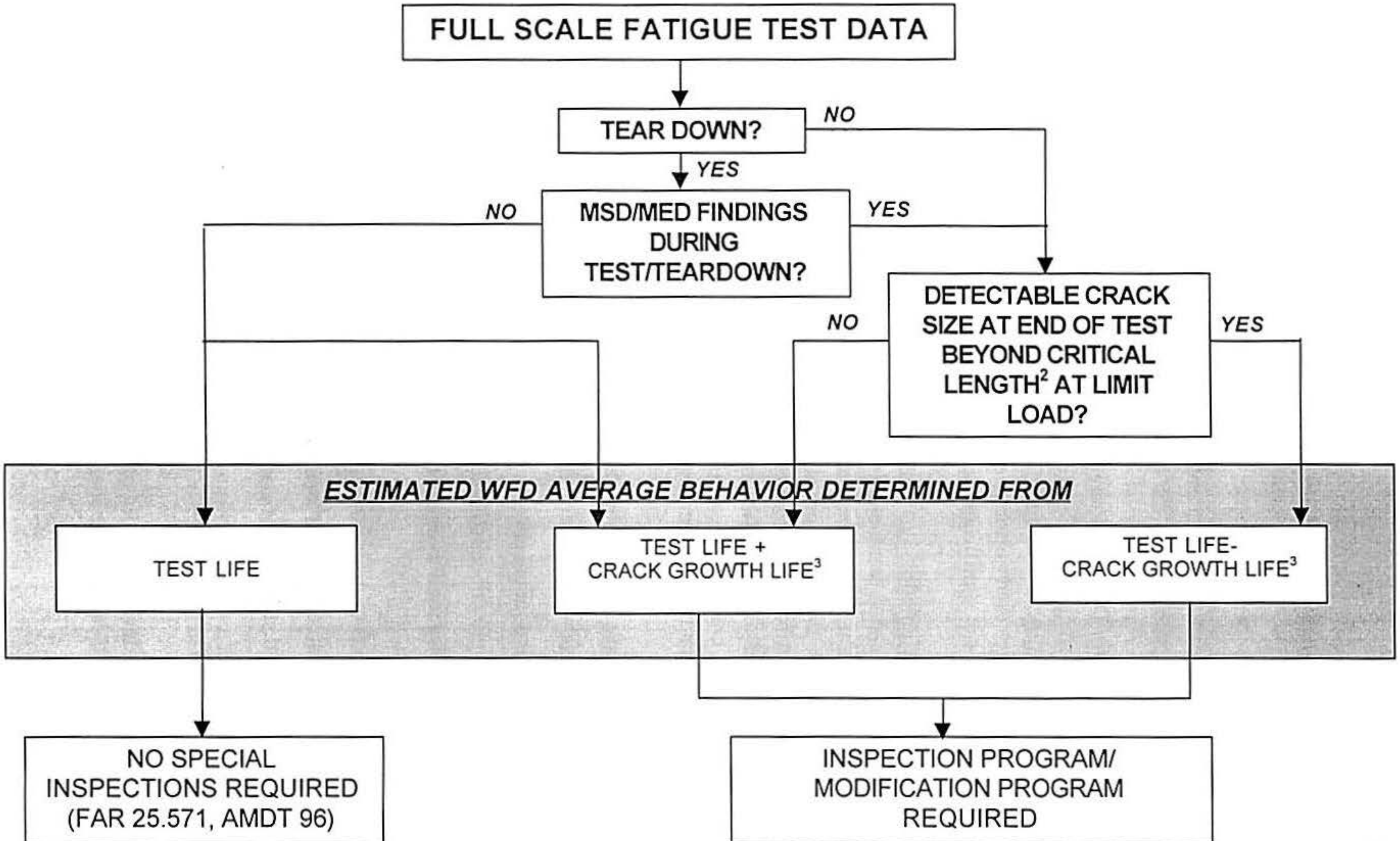


Figure A2-17 *Airplane Evaluation Process, Part 2 of 2*



1 ASSUMED STATE AT END OF TEST: Best estimate of non-detected damage from inspection method used at end of test or during teardown.
2 CRITICAL CRACK LENGTH: First link-up of adjacent cracks at limit load (locally) or an adequate level of large damage capability.
3 CRACK GROWTH LIFE: Difference between assumed state at end of test and critical crack length.

Figure A2-18 *Use of Fatigue Test and Teardown Information to Determine WFD Average Behavior*

(4) Crack Growth Calculation: 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 service fractographic data.

(5) 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 described in this guidance material should ensure the MSD sizes and densities, that normally would be expected to exist at the structural modification point, would not significantly change the risk of catastrophic failure due to DSD.

(6) Analysis Methodology: The evaluation methods used to determine the WFD average behavior and associated parameters will vary. The report "Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Airplane Fleet", Revision A, dated June 29, 1999 (a report of the Airworthiness Assurance Working Group for the Aviation Rulemaking Advisory Committee's Transport Aircraft and Engine Issues Group), discusses two Round Robin exercises developed by the TCH's to provide insight into their respective methodologies. One outcome of the exercises was an identification of key assumptions or methods that had the greatest impact on the predicted WFD behavior. These assumptions were:

- the flaw sizes assumed at initiation of crack growth phase of analysis;
- material properties used (static, fatigue, fracture mechanics);
- ligament failure criteria;
- crack growth equations used;
- statistics used to evaluate the fatigue behavior of the structure (e.g., time to crack initiation);
- methods of determining the structure modification point (SMP);
- detectable flaw size assumed;
- initial distribution of flaws; and
- factors used to determine were bound behavior as opposed to mean behavior.

The following elements are developed from paragraphs 3.c.(1) through 3.c.(6), above, and are necessary to establish a MSD/MED maintenance program for the area under investigation.

(7) Inspection Start Point (ISP): This is the point at which inspection starts if a monitoring period is used. 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.

(8) MED Considerations: Due to the redundant nature of semi-monocoque structure, MED can be difficult to manage in a fleet environment. This stems from the fact that most airplane structures are built-up in nature, and that makes the visual inspection of the various layers difficult. Also, visual inspections for MED rely on internal inspections and, therefore, recurring intervals are normally much greater than for external skin inspections. However, these issues are dependent on the specific design involved and the amount of damage being considered. In order to implement a viable inspection program for MED, the following conditions must be met:

(a) Static stability must be maintained at all times.

(b) Large damage capability should be maintained.

(c) There is no concurrent MED with MSD in a given structural area.

(9) Structural Modification Point (SMP).

(a) The applicant should demonstrate that the proposed SMP established during the audit has 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, based on the viability of inspections in the monitoring period. The SMP can be determined by dividing the WFD Average Behavior by a factor of 2 if there are viable inspections, or by a factor of 3 if inspections are not viable.

(b) Whichever approach is used to establish the SMP, a study should be made to demonstrate that the approach ensures that the expected extent of MSD/MED at the SMP still has a LDC to address damage from sources such as accidental damage, fatigue damage, or environmental degradation.

(c) An airplane may not be operated past the SMP unless the structure is modified or replaced, or unless additional approved data is provided that would extend the SMP. However, if during the structural evaluation for WFD, a TCH finds that the flight cycles and/or flight hours SMP for a particular structural detail have been exceeded by one or more airplanes in the fleet, the TCH should expeditiously evaluate selected high time airplanes in the fleet to determine their structural condition. From this evaluation, the TCH should notify the airworthiness authorities and propose appropriate service actions independent of the audit.

(d) The initial SMP may be adjusted based on the following:

(i) In some cases, the initial SMP may be extended without changing the required reliability of the structure, i.e. projection to that of a two life time full-scale fatigue test. These cases are:

- Additional fatigue and/or residual strength tests on a full-scale airplane structure or a full-scale component followed by detailed inspections and analyses.
- Testing of new or used structure on a smaller scale than full component tests (i.e., sub-component and/or panel tests).
- Teardown inspections (destructive) that could be done on structural components that have been removed from service.
- Local teardown by selected, limited (non-destructive) disassembly and refurbishment of specific areas of high-time airplanes.
- In-service date from a statistically significant number of airplanes close to the original SMP showing no cracking compared with the predictions. This data may be used to support increasing the original SMP by an amount that is agreed by the authority.
- Or a combination of any or all of the above.

(ii) If cracks are found in the structural detail for which the audit was done during either the monitoring period or the modification program, the SMP should be reevaluated to ensure that the SMP does in fact provide the required confidence level. If it is shown that the required confidence level is not being met, the SMP should be adjusted and the adjustment reflected in appropriate service bulletins to address the condition of the fleet. Additional regulatory action may be required.

(10) 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 cannot be detected, the SMP must be reevaluated to ensure there is a high confidence level that no airplane will develop MSD/MED before modification.

d. **Evaluation of Maintenance Actions**

(1) 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.

(2) 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.

(a) Determine the inspection requirements (method, 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.

(b) Review the elements of the existing maintenance programs already in place

(c) Revise and highlight elements of the maintenance program necessary to maintain safety.

(3) 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.

e. **Period of Evaluation Validity**:

(1) 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. However, it may be appropriate to vary the evaluation validity period depending on issues such as:

(a) the projected useful life of the airplane at the time of the initial evaluation;

(b) current non-destructive inspection (NDI) technology; and

(c) airline advance planning requirements for introduction of new maintenance and modification programs, to provide sufficient forward projection to identify all likely maintenance/modification actions essentially as one package.

(2) 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.

4. DOCUMENTATION.

a. 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 (LOV) 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. Since WFD is a safety concern for all operators of older airplanes, the FAA will make mandatory the identified inspection or modification programs. In addition, the FAA may consider separate AD action to address 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.

b. The following items should be contained in the FAA-approved documentation:

(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) maintenance program LOV in terms of flight cycles or flight hours.

c. The FAA-approved documentation should contain at least the following information for each critical part or component:

(1) description of the primary structure susceptible to WFD;

(2) details of the monitoring period (inspection start point, repeat inspection interval, SMP, inspection method and procedure (including crack size, location and direction) and alternatives) when applicable;

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

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

(5) service bulletins (or other service information publications) 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

(6) guidance to the operator on which inspection findings should be reported to the manufacturer, and appropriate reporting forms and methods of submittal.

5. REPORTING REQUIREMENTS

a. Operators, STC Holders and TCHs are required to report in accordance with various regulations, for example § 121.703, § 21.3, etc. (The regulations to which this AC relates do not require any reporting requirements in addition to the current ones.) 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 and manufacturer communication has been useful in identifying and resolving a number of issues that can be classified as WFD concerns. MSDMED has been discovered via fatigue testing and in-service experience. Airplane TCH's 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.

b. When damage is found while conducting an FAA-approved MSD/MED inspection program, or at the SMP where replacement or modification of the structure is occurring, the TCHs, STC Holders 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; and

- adjacent repairs within the same PSE.

c. 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.

d. 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.

e. Documentation will be provided by the TCH and 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.

6. STRUCTURAL MODIFICATIONS, REPAIRS, AND ALTERATIONS

a. All major modifications (STC's), repairs, and alterations that create, modify, or affect structure that is susceptible to MSD/MED (as identified by the TCH) must be evaluated to demonstrate the same confidence level as the original manufactured structure. The operator is responsible for ensuring the accomplishment of this evaluation. The operator may first need to conduct an assessment on each of its airplanes to determine what modifications, repairs, or alterations would be susceptible to MSD/MED. The following are some examples of types of modifications, repairs, and alterations that present 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 splice; and
- any modification, repair, or alteration that affects several frame bays.

b. 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 TCH baseline maintenance program requirements.);

- a modification that results in operational mission change that significantly changes manufactures load/stress spectrum (for example, a passenger-to-freighter conversion); and
- a modification that changes areas of the fuselage from being externally inspectable using visual means to being uninspectable (for example, a large external fuselage doubler that resulted in hidden details, rendering them visually uninspectable).

7. RESPONSIBILITY. It is expected that the evaluation will be conducted in a cooperative effort between the operators and TCH's, with participation by the appropriate airworthiness authorities during the evaluation.

Pratt & Whitney
400 Main Street
East Hartford, CT 06108

Pratt & Whitney
A United Technologies Company

April 18, 2007

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

Attention: Mr. Nicholas Sabatini, Associate Administrator for Aviation Safety

Subject: ARAC Tasking, Airworthiness Assurance Working Group, Federal Register Doc 04-10816, May 13, 2004, Phase 1, Task 3

Dear Nick,

The Transport Airplane and Engines Issues Group is pleased to forward the attached report from the Airworthiness Assurance Working Group as an ARAC recommendation. The Tasking requested the AAWG to consider how best to comply with the requirements set forth in 14 CFR 121.370a and 129.16, the Aging Airplane Safety Final Rule.

This final report is being submitted as a full consensus position of the AAWG and was approved unanimously by TAEIG.

TAEIG would like to thank the AAWG for their effort on this difficult and complex task.

Sincerely yours,

Craig R. Bolt

C. R. Bolt
Assistant Chair, TAEIG

Copy: Mike Kaszycki – FAA-NWR
Nic Davidson – FAA- Washington DC, Office of Rulemaking
Amos Hoggard - Boeing

March 23, 2007

Craig Bolt
Assistant Chair
Transport Airplane and Engine Issues
Aviation Rulemaking Advisory Committee
Pratt & Whitney
400 Main Street
East Hartford Connecticut 06108

RE: ARAC; Transport Airplane and Engine Issues – New Task FR Doc. 04-10816, Dated May 13, 2004, Phase 1, Task 3 Close-out.

Dear Mr. Bolt

On behalf of the Airworthiness Assurance Working Group (AAWG), we the undersigned are pleased to submit a Final Report concerning the referenced task for your consideration. The Tasking requested the AAWG to consider how best to comply with the requirements set forth in 14 CFR 121.370a and 129.16, the Aging Airplane Safety Final Rule. Specifically this task element asked the AAWG to consider 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. In December 2005, the AAWG made certain recommendations for this task to the TAEIG that required additional development. The contents of the attached report contain the conclusions and recommendations of this activity.

This final report is being submitted as a full consensus position of the AAWG; there are no dissenting opinions.

The final report for task 3 presents a separate advisory circular (AC) that provides direction to the TCH and Operator in determining maintenance programs for baseline fatigue critical structure for widespread fatigue damage (WFD) and the means to determine a Limit of Validity (LOV) of the maintenance program. In addition, this report outlines the procedures to be used for the consideration of widespread fatigue damage that might develop in repairs, alterations and modifications (RAMs) to baseline structure. This report completes Task 3.

The AC contained in Appendix C conforms to FAA policy delineated in PS-ANM110-7-12-2005, Policy Statement, “Safety – A Shared Responsibility - New Direction for Addressing Airworthiness Issues for Transport Airplanes,” issued July 6, 2005, effective July 12, 2005. The positions developed and presented in this report have evolved over a period of time and are based on reasoned discussions that occurred during the Tasking. However, Rulemaking is underway and guidance material is being published even as these positions are being submitted. In light of this very dynamic situation, the conclusions and recommendations made in this report must be considered as based on the best available information. It is expected that the FAA will consider the information contained herein in developing the final guidance on this subject. Should the FAA make changes to their anticipated course of action, or if other information comes to light, specific recommendations in this report may no longer be the most appropriate course. To help continue in moving this effort forward, the AAWG is available to discuss any of these positions that the FAA may find unclear or confusing, or based on outdated assumptions.

The AAWG wishes to thank the FAA and ARAC; TAEIG for allowing us to participate in this important rule making event.

Rao Varanasi	Mark Yerger
Co-Chair AAWG	Co-Chair AAWG
Boeing Commercial Airplanes	Federal Express

A REPORT OF THE AIRWORTHINESS ASSURANCE WORKING GROUP

RECOMMENDATIONS CONCERNING ARAC TASKING FR Doc. 04-10816

RE: AGING AIRPLANE SAFETY FINAL RULE

14 CFR 121.370a AND 129.16

TASK 3 FINAL REPORT

FINAL REPORT

March 22, 2007

Rev A April 11, 2007

SIGNED BY

Rao Varanasi	***Mark Yerger***
Co-Chairperson, AAWG	***Co-Chairperson, AAWG***
Boeing Commercial Airplanes	***Federal Express***

REVISION PAGE

LTR	DATE	CHANGE	PAGES ADDED	PAGES DELETED	PAGES CHANGED	APPROVED BY
A	11 Apr 07	Page 9, Paragraph A2, Change the word “need” to “should”. Page 11, Repair Recommendation No. 3, Change the phrase “…recommends that repairs for WFD be addressed on a …..” to “….recommends that published repairs be addressed for WFD on a…..”			9, 11	AWH

Table of Contents

List of Figures

List of Tables

List of Abbreviations

The following abbreviations are used throughout this report

AAWG	Airworthiness Assurance Working Group
AC	Advisory Circular (FAR)
AD	Airworthiness Directive
ALS	Airworthiness Limitation Section
ARAC	Aviation Rulemaking Advisory Committee
ATC	Amended Type Certificate
CAR	Civil Airworthiness Requirements
CFR	Code of Federal Regulations
DAH	Design Approval Holder
DSG	Design Service Goal
EASA	European Aviation Safety Agency
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
HPF	Hours per Flight
ISP	Inspection Start Point
LOV	Limit of Validity
MED	Multiple Element Damage
MPD	Maintenance Planning Document
MSD	Multiple Site Damage
MTGW	Maximum Takeoff Gross Weight
NPA	Notice of Proposed Amendment
NPRM	Notice of Proposed Rule Making
PMI	Principal Maintenance Inspector (FAA)
OIP	Operator Implementation Plan
RAG	Repair Assessment Guidelines
RAM	Repairs, Alterations and Modifications
RAP	Repair Assessment Program
REG	Repair Evaluation Guidelines
SB	Service Bulletin
SMP	Structural Modification Point
SRM	Structural Repair Manual
STC	Supplemental Type Certificate
STG	Structures Task Group
RI	Repeat Inspections
TC	Type Certification
TCH	Type Certificate Holder
WFD	Widespread Fatigue Damage

Executive Summary

On May 13, 2004, the FAA published a new ARAC tasking and assigned it to the Transport Airplane and Engine Issue Group/Airworthiness Assurance Working Group. The Tasking requested Industry assistance in preparing guidance material for certificate holders wishing to show compliance to the Aging Airplane Safety Final Rule, 14 CFR 121.1109 and 129.109. The Tasking consisted of four sub-tasks to be accomplished in two phases. In Phase 1, tasks 1, 2, and 3 are completed; in Phase 2, task 4 will be completed.

The AAWG has submitted two reports (References B.5.n and B.5.o) dated 28 October 2005 and 12 May 2006, respectively. The first report contained an AC which proposed a means of compliance for damage tolerance inspections and procedures for repairs (Task 1). The second report presented a modified version of the originally submitted AC that provided guidance for the DAH (refers to Type Certificate Holder (TCH) or Supplemental Type Certificate Holder) and operators in developing damage tolerance inspections and procedures for alterations (Task 2). This report presents a separate advisory circular (AC) that provides direction to the TCH and Operator in determining maintenance programs for baseline fatigue critical structure for widespread fatigue damage (WFD). In addition, this report outlines the procedures to be used for the consideration of widespread fatigue damage that might develop in repairs, alterations and modifications (RAMs) to baseline structure. This report completes Task 3.

<u>Conclusions and Recommendations (Widespread Fatigue Damage)</u>

The proposed AC addresses actions to be accomplished to preclude the development of WFD in the baseline as delivered structure as modified by any AD. The report also outlines how repairs and alterations to both baseline structure as well as repairs to alteration and modifications should be considered for WFD.

The AC contained in Appendix C conforms to FAA policy delineated in Reference B.2.a and represents a consensus position of Industry. The positions developed and presented in this report have evolved over a period of time and are based on reasoned discussions that occurred during the Tasking. . However, Rulemaking is underway and guidance material is being published even as these positions are being submitted. In light of this very the conclusions and recommendations made in this report must be considered as based on the best available information. It is expected that the FAA will consider the information contained herein in developing the final guidance on this subject. Should the FAA make changes to their anticipated course of action, or if other information comes to light, specific recommendations in this report may no longer be the most appropriate course. To help continue in moving this effort forward, the AAWG is available to discuss any of these positions that the FAA may find unclear or confusing, or based on outdated assumptions.

The following conclusions and recommendations are made:

Conclusions

A. ARAC Tasking

1. The AAWG concludes that the simultaneous requirements of developing data to enable operator compliance to both the DT and WFD rules for all applicable airplanes would create a significant resource shortfall across the industry with no clear means to mitigate that shortfall.
2. The AAWG concludes that there is insufficient fleet evidence to support a rule for the assessment of RAMs for WFD and that the FAA should not promulgate final rules that contain provisions for the assessment of RAMs for WFD. Therefore specific guidance, in the form of an AC for WFD, is not warranted for RAMs at this time. A
3. The AAWG concludes that there is a significant cost burden imposed on the TCH, operator and FAA to require separate updates of repair publications and assessments for DT and WFD if requirements for WFD of repairs are mandated at a later time.
4. The AAWG concludes that the Structures Task Group process will be required to develop the necessary data under §25.WFD for operator compliance to §121.WFD and §129.WFD.
5. The AAWG concludes that a review of all alterations would create an unnecessary burden on the industry that would not enhance continued airworthiness.
6. The AAWG concludes that a simplified methodology is needed to support third parties for the WFD development for RAMs.
7. The AAWG concludes that there is a concern that the subjects discussed in this report have not been harmonized between the FAA and EASA.

B. Baseline Structure

1. The AAWG concludes that it is necessary to define the means of compliance for assessing the WFD characteristics of airplane baseline structure before a means of compliance could be defined for repairs and alterations.
2. The AAWG concludes that airplanes certified prior to 1958 should not be considered for WFD. These aircraft do not fall under consideration for 14 CFR 121.370a or 129.16 for Damage Tolerance, and there is insufficient information to successfully complete a WFD assessment on these airplanes.
3. The AAWG concludes that the baseline configuration, including model variants and any mandated modifications should be defined prior to the analysis of specific WFD prone areas.
4. The AAWG concludes that an LOV is only required if the high-time airplane will reach and exceed the DSG.

5. The AAWG concludes that the timing of the development of an LOV and maintenance actions should be based on the flight cycles and/or hours of the high-time airplane relative to the DSG
6. The AAWG concludes that an LOV extension package will, based on current understanding of the processes and available technology, take a minimum of 4 years to prepare and should follow the same process used to develop the initial LOV.
7. The AAWG concludes that there is a misunderstanding in the industry of what the DSG represented and has therefore further developed this topic in the report.

C. Repairs

The AAWG concludes that there is no information that a properly installed repair has exhibited WFD in service.

D. Alterations

AAWG concludes that certain categories of alterations have the potential of developing WFD and should be reviewed.

Recommendations

A. ARAC Tasking

1. In support of the ARAC tasking and possible future rulemaking on RAMs, the AAWG provided the following information.
   a. An analytical methodology to be used by third parties to perform WFD evaluations of repairs and alterations.
   b. Scope of testing required to support WFD evaluations of new repairs and alterations.
   c. Screening process for new repairs and alterations.
   d. Approval process for new repairs and alterations.
   e. Assessing need to evaluate existing repairs and alterations.
2. If the FAA promulgates new rulemaking for assessment of RAMs for WFD, the AAWG recommends that guidance information should be placed in an amended AC 120-WFD.
3. The AAWG recommends that the requirements and means of compliance for Damage Tolerance and Widespread Fatigue Damage in FAA and EASA are harmonized.

B. Baseline Structure

1. The AAWG recommends that the FAA adopt AC 120.WFD as a means of compliance for WFD assessment of baseline structure as presented in Appendix C.

2. The AAWG recommends that the airplanes most at risk for the development of WFD be the first to be evaluated for WFD. These would include all airplanes that have exceeded their DSG.
3. The AAWG recommends that the applicability of the WFD rule be changed to match applicability requirements of the AASR and EAPAS proposed rule. Specifically, the applicability statement should be amended to include the following criteria - Transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958.
4. The AAWG recommends that the TCH should be allowed to define the structural baseline configuration of the airplane, including all model derivatives, incorporating those structural ADs that have a significant effect on the WFD characteristics of the airplane.
5. If the high-time airplane has already exceeded the DSG, the AAWG recommends the LOV be made available to the FAA by June 20, 2009 or one and a half years prior to the compliance date of the WFD rule, whichever is later.
6. For airplanes where the high-time airplane is within five years of reaching the DSG, the AAWG recommends the LOV for the baseline structure should be made available to the FAA three and a half years after the effective date of the rule or one and a half years prior to the time the high time airplane reaches DSG, whichever is later.
7. For all other airplanes, the AAWG recommends that the process of determining the LOV needs to begin when the high-time airplane reaches 75% DSG or roughly 5 years before it reaches the DSG.
8. The AAWG recommends the operator contact the TCH to initiate LOV extension preparation a minimum of 4 years in advance of the need.
9. The AAWG recommends the TCH establish/maintain STG's for the affected airplane models to develop the required data, including the LOV and associated maintenance actions as well as provide technical and economic input to the overall process.

C. Repairs

1. For airplanes that require updates to their publications for DT and which have airplanes above DSG on December 20, 2009, the AAWG recommends that the update for WFD compliant repair publications occur at the same time.
2. For all other airplanes, the AAWG recommends that for repairs, WFD is addressed by the TCH by updating their publications (SRMs, SBs, RAG, DT Compliance Document, etc…) to include WFD instructions by the same time they publish the WFD LOV and maintenance actions for the baseline structure.
3. For airplanes that will require updates of published repair data, the AAWG recommends that published repairs be addressed for WFD on a go forward basis and should not occur separately from the DT review for Pre-amendment 45 airplanes. A

4. The AAWG recommends that there should be no rulemaking initiative that would require retrospective requirements to re-review repairs for WFD after a DT assessment, unless a specific airworthiness concern is identified.

D. Alterations

The AAWG recommends that alterations for WFD be addressed in a two-step approach.

a. New Alterations certified after the effective date of the §25.WFD should be handled by the change product rule 14 CFR 21.101 by making 14 CFR 25.WFD applicable.
b. Existing alterations should be categorized into a few special types and reviewed in a FAA Special Certification Review (SCR) with the outcome being a determination if a WFD assessment is necessary in addition to the already required DT assessment.

1. Introduction

A. New Tasking

On May 13, 2004, the FAA published a new ARAC tasking and assigned it to the Transport Airplane and Engine Issue Group/Airworthiness Assurance Working Group. The Tasking requested Industry assistance in preparing guidance material for certificate holders wishing to show compliance to the Aging Airplane Safety Final Rule, 14 CFR 121.1109 and 129.109. The Tasking consisted of four sub-tasks to be accomplished in two phases. In Phase 1, Tasks 1, 2, and 3 are completed; in Phase 2, Task 4 is completed. The complete tasking statement is contained in Appendix B. Section 2 of this report documents the data provided to support the task contained in Phase 1, Task 3 - Consideration of Widespread Fatigue Damage for RAMs.

B. 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:

ABx Air*
Airbus *
Airline Pilot's Association
American Airlines*
Air Transport Association
American West Airlines
Boeing Commercial Airplanes*
British Airways*
Continental Airlines*
Delta Air Lines Incorporated*
Evergreen International Airlines
Federal Aviation Administration*
Federal Express*
Fokker Service
International Air Transport
Japan Air Lines*
EASA*
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 participated in the task group. A list of meeting venues and meeting attendance is documented in Appendix H respectively.

2. Task 3 – WFD Considerations for Baseline Structure and RAMs

A. Tasking Statement

The AAWG was asked to consider the following in regards to WFD of RAMs:

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.

B. Introduction To Task 3

In May 2006, the FAA issued a draft AC 120-YY that attempted to define the steps needed to perform a WFD assessment of the baseline, as delivered structure. The industry reviewed this document and provided feedback to the FAA in September 2006. That feedback largely discounted AC 120-YY as a usable document and requested that the industry be enlisted to assist the FAA in rewriting the document. The information contained in this section and Appendix C provides industry guidance and a proposed AC on this matter. The AAWG believed that it was necessary to define the means of compliance for the baseline structure before a means of compliance could be defined for repairs and alterations. To this end, the AAWG developed AC 120.WFD (see Appendix C) that addresses TCH compliance actions required for baseline structure. Those compliance actions include the determination of an LOV and supportive maintenance actions to preclude WFD up to the LOV for the baseline structure. The AAWG recommends that the FAA adopt AC 120.WFD as a means of compliance for the baseline structure.

C. Summary of AAWG Position on Repairs and Alterations

1) Repairs

For repairs, the AAWG recommends that the TCH update their publications (SRMs, SBs, RAG, DT Compliance Document, etc…) to include WFD instructions at the same time they issue the WFD maintenance requirements for the baseline structure. If the TCH has an additional task to update his documents for damage tolerance (DT), the AAWG suggests that the update for WFD occur at the same time. The TCH should consider doing this with or without specific rule requirements for WFD. Once published, the operators have the opportunity to revise their maintenance program to include repairs that have maintenance instructions that include both DT and WFD considerations for future published repairs.

2) Alterations

For Alterations, the AAWG recommends that alterations for WFD be addressed in a two-stage approach. For new alterations certified after the effective date of the §25.WFD, those alterations should be handled by the change product rule 14 CFR 21.101 already in place by making 14 CFR 25 Amendment 96 applicable. For existing alterations, they should be categorized into a few special types that are detailed later in this report. Depending on category, these alterations should be reviewed in a Special Certification Review (SCR) with the outcome being a determination if additional action is required.

D. AAWG Understanding of FAA Position on WFD.

1) WFD NPRM

There have been no WFD attributed accidents in the last nineteen years. There is, however, a technical concern that WFD will occur in the commercial fleet and could potentially affect any airplane in service.

The AAWG is aware that the FAA is considering that when and if the final rule is published, it may be limited to the baseline structure since this is the only structure that has demonstrated development of WFD in-service.

The original concept for the NPRM was to require the TCH to establish an LOV for all models on a certain date via a part 25 rule and then require the operators to adopt the LOV requirement into the maintenance program through an operational rule.

Because of due process considerations, any maintenance actions required to preclude WFD up to the LOV will need to be mandated by AD.

2) Repairs

The FAA position on existing un-published repairs in the WFD NPRM was that a WFD evaluation was not required until an extension of the OL (LOV) was sought. Notwithstanding, the FAA NPRM proposes the TCH update published repair data for all applicable airplanes by a certain date. In making this finding, the FAA has determined that rules for existing repairs requiring a DT evaluation alone are sufficient up to first LOV.

Given the repairs position put forward in the WFD NPRM, it would be extremely difficult to include existing repairs in the proposed rule without supplemental rulemaking since this would be viewed by OMB as increased scope.

The AAWG is aware that the FAA is considering the options for the assessment of existing repairs for WFD at this time

3) Alterations

The NPRM proposes the TCH to make available guidelines to third parties to enable them to determine the appropriate maintenance actions for WFD of alterations. In response to this requirement the industry commented that this was not an achievable task based on several factors. The AAWG is aware that the FAA is considering postponement of the requirement for WFD of alterations since there are no usable guidelines for third parties to use and the development of these guidelines are not likely

4) Future Action On RAMs

Any future action on RAMs will be dependent on the publication of a rule for baseline structure and the development of acceptable standards for third parties.

It is the AAWG's understanding that it is the desire of the FAA to align the WFD requirements for RAMs with the DT rule, however timing considerations may force implementation at a later time by supplemental NPRM.

The FAA has requested the AAWG provide information that would be used to support future WFD rulemaking for repairs and alterations, should the FAA decide that repairs and alterations require such rules.

5) The FAA ARAC Tasking

While the direction of the FAA rulemaking is not fully known at this time, the FAA's desire is to have ARAC complete the tasking to provide credible information should rulemaking be later found to be necessary. They are interested in the AAWG position on Baseline structure and RAMs.

E. Harmonization

1) Potential Impact to the Industry if EASA Deviates From FAA Approach

There is an AAWG concern that EASA may not follow the FAA approach adopted for both DT and WFD and may create additional compliance issues for the industry. In 2006, EASA issued NPA 05-2006 dealing with the Aging Airplane requirements. The AAWG is aware that the NPA does not follow the FAA chosen approach for either DT or WFD. In this NPA the EASA asked for review of all modified or repaired structure to ensure that any required maintenance action for the prevention of WFD is defined and enacted. This is in contradiction to the FAA proposed plan to review repairs later in life or maybe only at DSG or LOV. If two different authorities publish conflicting requirements, this will mean that the TCH will need to comply with the more restrictive rule. Therefore the TCH will have to perform the WFD analysis and update his in-service documents covering all RAMs and possibly do the work twice as described above.

There is distinct possibility that if the update of published documents twice, that the two sets of documents will be quite different and lead to significant confusion over which standards are applicable. This would also be a challenge for the PMI to approve the operator maintenance plan.

Some foreign operators also operate N-registered airplanes in addition to airplanes registered in their home countries. This could present a significant increase in cost of maintaining two separate maintenance programs within one model fleet.

Approximately 30 % of the airplanes in service today are leased airplanes which are transferred frequently from one operator to another. Having a non-harmonized WFD rule will have a significant impact on the leasing companies as well as when an operator buys or sells an airplane to another part of the world. In this case this would either mean a reduced residual value of the airplane or additional cost to upgrade the plane to comply with the different requirement.

2) AAWG Recommendations Concerning Harmonization

The AAWG recommends that the FAA and EASA requirements and means of compliance for Damage Tolerance and Widespread Fatigue Damage are harmonized so that there is only one means of compliance.

F. AAWG Previous Recommendations RE: WFD

1) Previous ARAC Recommendations regarding WFD to Baseline Structure

In 2001, ARAC recommended (see Reference (B.5.d)) that large transport airplanes can be operated up to DSG before a WFD assessment of the baseline structure is required. This position was restated in 2003 (see Reference (B.5.b)) and again in the October 2005 report (see Reference (B.5.n)). This recommendation was primarily for airplanes certified prior to 14 CFR Amendment 45 yet the AAWG believed that this is also appropriate for all post amendment 45 airplanes where a two lifetime fatigue test was performed. One of the AAWG recommendations was to determine a Limit of Validity (LOV) for the maintenance program. Another AAWG recommendation was to establish maintenance actions that would preclude the development of WFD on the baseline structure up to the LOV.

2) Discussion of Previous Recommendations

Separately the FAA issued an interim final rule in December 2002 requiring operators to have a damage tolerance based structures maintenance program. This operational rule, the Aging Airplane Safety Rule (AASR) was finalized in February 2005 with a compliance date of December 2010. In addition, the FAA published NPRMs for WFD and supplemented the AASR rules in April 2006 that proposed that specific timelines be imposed on the type certificate and STC holders in developing work packages required to support operator compliance to the final and proposed rules. These time schedules created significant and untenable resource issues within the industry.

The WFD and AASR rulemaking initiatives in 2006 would place a regulatory requirement on the TCH via a 14 CFR Part 25 rule to produce documentation that would support operator compliance to a corresponding a 14 CFR Part 121/129 operational rule. This rulemaking change is a result of a new FAA Policy (Reference B.2.a) that defines the roles and the responsibility/burden of compliance and affects the organization of guidance material to support compliance. Specifically, the TCH will be required to make available any necessary compliance data that the operator requires to demonstrate compliance to the operational rules

The AAWG still believes that guidance material is needed to support the TCH to develop a WFD plan for baseline structure

G. AAWG Discussion and Recommendations for Baseline Structure

1) 2007 ARAC Recommendations regarding WFD to Baseline Structure

The development of maintenance instructions for RAMs requires the knowledge of the WFD requirements for the baseline structure. Attempting to address RAMs before the baseline structure may result in inappropriate and perhaps incorrect maintenance instructions. The definition of the baseline WFD program forms the basis of how future actions must be treated. For example, a baseline detail that requires inspections for WFD will be mandated by AD. Repairs and/or alterations to that detail will require an AMOC. Therefore, the AAWG has made a determination that a program to address WFD on baseline structure needs to defined prior to considering how and when to implement a means to address WFD of RAMs.

The AAWG recommends that the program for baseline structure consist of a determination of LOV and associated maintenance actions to preclude WFD up to the LOV. These recommendations are consistent with the 2001 recommendations for Pre-amendment 45 and further extend these recommendations to airplanes certified to amendment 45 or later as well. The AAWG has drafted a suggested revision to AC 120-yy entitled AC 120.WFD. This AC is contained in Appendix C of this report.

2) AAWG Recommended Changes for Guidance Material For Baseline Structure

a) Need to Address High-Risk Airplanes First.

The proposed FAA WFD NPRM required that all airplanes receive an audit for WFD on the baseline structure by a certain date. This requirement included the establishment of an LOV and any maintenance actions required to preclude the occurrence of WFD up to the established LOV. The FAA based their requirements on the 2001 AAWG recommendations concerning WFD. These recommendations were provided without the knowledge of FAA's intent to publish the Aging Airplane Safety Rule in late 2002. As a result, the simultaneous requirements of developing data to enable operator compliance to both rules for all applicable airplanes would create a significant resource shortfall across the industry with no clear means to mitigate that shortfall.

The AAWG recommends that the airplanes most at risk for the development of WFD be the first to be evaluated for WFD. These would include all airplanes that have exceeded their DSG. The AAWG has established that most of the work has already been completed on the airplanes in question and it would be possible to have the maintenance material ready by the compliance date established in the AASR Final Rule. The Airplane Models that fall into this category would be:

A300*
A300-600
A310-200/300

B707/720*
B727*
B737 CL*
B747 CL*
DC-8*
DC-9/MD-80*
DC-10*

L1011*

F28*

BAC 1-11*

***** ***Eleven Aging Airplane Models considered by the AAWG***

For airplanes where the high time airplane has not exceeded the DSG, the AAWG recommends that the data required for compliance to the WFD rule be provided by one and a half years before the high-time airplane reaches DSG or three and a half years after the effective date of the rule whichever occurs later. This is consistent with the AAWG recommendations for a proposed amendment to AC 91-56 which was never released.

See Appendix F for a discussion of DSG and how it would be applied in determining when a High Time Airplane would exceed the DSG.

b) Airplanes Certified Prior to 1958

The FAA NPRM includes consideration for all airplanes certified to operate under 14 CFR Parts 121/129 with maximum takeoff gross weights greater than 75,000 lbs. There are several airplanes that were certified prior to 1958 that will qualify for consideration for WFD under this proposed requirement. These airplanes are not considered under 14 CFR 121.370a or 129.16 for Damage Tolerance. However, these airplanes would require consideration under the proposed rules for WFD. While the original NPRM submitted in 2001 did allow this interpretation, the AAWG never in fact intended such an interpretation. The main concern that the AAWG focused on was the 11 airplane models listed above in paragraph 2.F.2.a.

The AAWG believes that there is insufficient information based on the certification procedures and requirements existing at the time of certification, including lack of fatigue test requirements and specific airplane flight cycles and flight hour data recording requirements to successfully complete a WFD assessment on these airplanes. The AAWG also would point out that it would be impossible to complete a WFD assessment before an analysis of the damage tolerance characteristics of the airplane.

Therefore the AAWG has concluded that airplanes certified prior to 1958 should not be considered for WFD. These aircraft do not fall under consideration for 14 CFR 121.370a or 129.16 for Damage Tolerance, and there is insufficient information to successfully complete a WFD assessment on these airplanes. The AAWG recommends that the applicability of the WFD rule be changed to match certain applicability requirements of the AASR and EAPAS proposed rule. Specifically, the applicability statement should be amended to include the following criteria - Transport category, turbine powered airplanes with a type certificate issued after January 1, 1958.

c) Baseline Considerations

i. Baseline Airplane AD Configuration

The FAA NPRM on WFD contains a requirement to establish the configuration of the airplane considering all models and derivatives combined with all airworthiness directives that required structural modification. While the AAWG agrees with the basic concept presented in the FAA NPRM the provision of the requirement for ALL ADs seems inappropriate. The AAWG recommends that the TCH should be allowed to define the structural baseline configuration of the airplane to be analyzed including all model derivatives and those structural ADs that have a significant effect on the WFD characteristics of the airplane. The TCH should propose the analysis configuration to the FAA with supporting rationale.

ii. Baseline LOV Process

The development of the LOV is primarily a TCH task assisted by the operators. Two basic things must be determined:

1. Economic consideration that the airplane will be operated past DSG; and
2. Service experience necessary to complement the fatigue test evidence.

In 1999, ARAC provided some details (Reference B.5.a) concerning how LOV was to be determined. The following is an excerpt from that report:

"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 maintenance 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."

The AAWG has had several discussions with the FAA since the publication of the WFD NPRM where the FAA requested clarification of the industry position presented above. These clarifications deal with the AAWG position, the terminology used and a request for a formal process to derive the LOV. In response to these requests for clarification, the following is offered:

1. The FAA noticed that the AAWG has asserted that the RAP must be in place and operational as a prerequisite to starting the WFD program. The FAA has noted that not all airplanes have a RAP and has asked if this means that a RAP will be developed for airplanes that do not have it. The AAWG believes that the development of a RAP is an economic issue for the TCH to consider: some airplanes will benefit from a RAP; others may not. Nevertheless a REG is required for the AASR and gives guidance to the operators in determining damage tolerance based maintenance programs for repairs on the airplanes they own. As a result the AAWG is removing this item from the prerequisites list.

2. The FAA has noted that some terminology could be confusing. The AAWG offers the following clarifications:
    a. ***Tear down***, when used by itself means the detail examination of disassembled components using visual (magnifying glass, dye penetrant etc) and/or other NDI techniques (eddy current, ultrasound etc) to establish the structural condition. Structure that undergoes this type of a tear down is considered destroyed in the process.
    b. ***Tear down and refurbishment*** is a process where the structural condition of a local area of an in-service airplane is determined by the removal of fasteners and subsequent inspection of the holes using NDI techniques. Following inspection and correction of any conditions found, the holes are oversized, appropriate sized fasteners are re-installed and the airplane is returned to service. Data collected from a number of airplanes is useful in establishing specific fatigue test evidence were actual fatigue test may not exist.
    c. ***Component*** is used to mean a major or entire section of the Wing, Fuselage or Empennage.

3. In consideration of a formal process to arrive at an LOV, the AAWG notes that this process is TCH specific. Airbus and Boeing have nonetheless established a generic process that could be used to develop an LOV. The following, which is also included in the proposed AC, is offered as one way but not the only way of determining LOV:

(iii) Ascertain Interest To Operate The Airplane Past DSG

The first objective is normally determined with conversations with the operators/owners of the airplane model under consideration. The TCH should establish a candidate LOV. Nominally the means to develop the candidate LOV will be different for airplanes that have reached DSG verses those who have yet to reach it. Older airplanes may rely on Fleet Proven life to provide an initial estimate; younger airplanes may rely on an estimate based on a reduction of the fatigue reduction factor used in the analysis or test data. Discussion with operators may also be useful in determining an initial number. A candidate LOV does not necessarily establish the actual LOV. Depending on the airplane under consideration, the LOV may be expressed in terms of flight cycle, flight hours, or both and should take into account the anticipated future usage of the fleet, as well as the means available to the TCH to justify it.

(iv) Service Experience Necessary To Complement The Fatigue Test Evidence

The second objective is accomplished by the collection and reduction of data necessary to extend Fatigue Test Evidence. This task is normally performed by the TCH. Fatigue Test Evidence is a collection of direct and derived data and includes data from the following:

- Data from Fatigue Tests
  - Full scale fatigue test with or without tear down
  - Full scale component (wing, fuselage, empennage, etc.) tests with or without tear down
  - Less than full scale component tests
- Data derived from Analysis based of Fatigue test and service experience
  - Fleet proven life techniques
  - Tear down of a high time airplane
  - Evaluation of fatigue test data and in-service problems experienced by other airplanes with similar design concepts using analysis methods which have been parametrically developed to reflect fatigue test and service experience.

Normally the data collected above is airplane level data. It is assumed that any issue that has been revealed in service has already been addressed and the data collected is representative of future predictive behavior. The data collected can be used in the applicant's methods and procedures to predict the LOV. 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 DSG or previously established 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.

The validation of the LOV for a particular fleet represents an evaluation of the data available, including technical, economic and managerial issues. It is more than examining fatigue test evidence.

Once established, the candidate LOV is validated by the seven-step process outlined below:

Step 1 – Validate that the Aging Programs are in place and operational.

Step 2 – Examine the data that establishes the amount of Fatigue Test Evidence available.

- **a.** Full scale Fatigue Test Results – WFD findings and what done about the findings including extension of test coverage to other models and derivatives.
- **b.** Fleet specific in-service WFD findings and what done about them. Rationalization with fatigue test results.
- **c.** Calculation of the Fleet Proven Life.
- **d.** Establish an understanding of the Design factors such as:
  - a. Fatigue Reduction Factor
  - b. Expected Wing/Fuselage/Empennage/1P Stress levels
  - c. Analytical predicted fatigue lives
- **e.** Rationalization of other fleet model MSD/MED events relative to expected in-fleet fatigue performance and what was done about it. Cross model safety evaluations.
- **f.** Understanding of which areas of the airplane requiring additional data and establish a plan to collect that data.
  - a. Additional fatigue tests; and/or,
  - b. Teardown and refurbishment of a percentage of in service airplanes prior to entering an extended usage; and/or,
  - c. Destructive teardown of one or several retired high-time airplanes.

Step 3 - Estimate the cost of additional TCH/operator actions required in collecting additional Fatigue Test Evidence

Step 4 - Make an upper limit estimate of the LOV based on the data examined. This will rely on looking on the fatigue test and analysis data collected in Tasks B and C.

Step 5 – Evaluate the maintenance actions and economics required to maintain safety out to the candidate LOV.

1. Determine the areas that are susceptible to WFD (See Appendix 4)

2. Establish the analysis configuration relative to production variants and AD mandated maintenance actions that would affect the analysis results (See Section 203 and Appendix 5)
3. Determining WFD Average Behavior (See Appendix 5)
4. For each area determine the ISP and SMP (See Appendix 6)
5. For those items that have an ISP within the candidate LOV, establish the proposed inspection if feasible.
6. For those items that have an SMP within the candidate LOV, establish the proposed rework/design change required.
7. Estimate cost of the package both to the TCH and to the operator.

Step 6 – The economics of the package must be rationalized. The candidate LOV may need to be adjusted based on the economics of additional required testing or data collection and the maintenance actions required to maintain safety. The results are the LOV.

Step 7 – Revision of required certification documents for an operator to take advantage of the LOV including the development of maintenance actions.

c) Timing of LOV Development

As discussed in Section 2.F.2.a, the AAWG has concluded that the timing of the development of LOV and maintenance actions need to be based on the flight cycles and hours of the high-time airplane relative to the DSG.

Most older airplanes already have high-time airplanes that have exceeded DSG. Airplanes certified to 14 CFR 25 Amendment 45 or later that have two-lifetime fatigue tests have had a history of reaching DSG before there is a significant probability of occurrence of WFD. Therefore, the AAWG has concluded that an evaluation for LOV is only required if the high-time airplane will reach the DSG. The determination of LOV is, in part, based on the amount of fatigue test evidence held by the TCH. Fatigue test evidence comes, in part from in-service experience. Therefore the amount of fatigue test evidence is generally maximized when the high time airplane reaches DSG allowing the highest reasonable determination of the LOV before there is a significant exposure to the prospect of developing WFD. The LOV is stated in terms of flight cycles or flight hours or both.

Based on this, the AAWG is recommending a staged approach to when the LOV is determined based on the position of the high-time airplane within a model relative to DSG.

If the high-time airplane has already exceeded the DSG, the AAWG recommends the LOV be made available to the FAA by June 20, 2009 or one and a half years prior to the compliance date of the WFD rule, whichever is later.

For airplanes where the high-time airplane is within five years of reaching the DSG, the AAWG recommends the LOV for the baseline structure should be made available to the FAA three and a half years after the effective date of the rule or one and a half years prior to the time the high time airplane reaches DSG, whichever is later.

For all other airplanes, the AAWG recommends that the process of determining the LOV needs to begin when the high-time airplane reaches 75% DSG or roughly 5 years before it reaches the DSG.

Following FAA review and approval of the LOV, the TCH would make the LOV available to the operator to incorporate into their maintenance program.

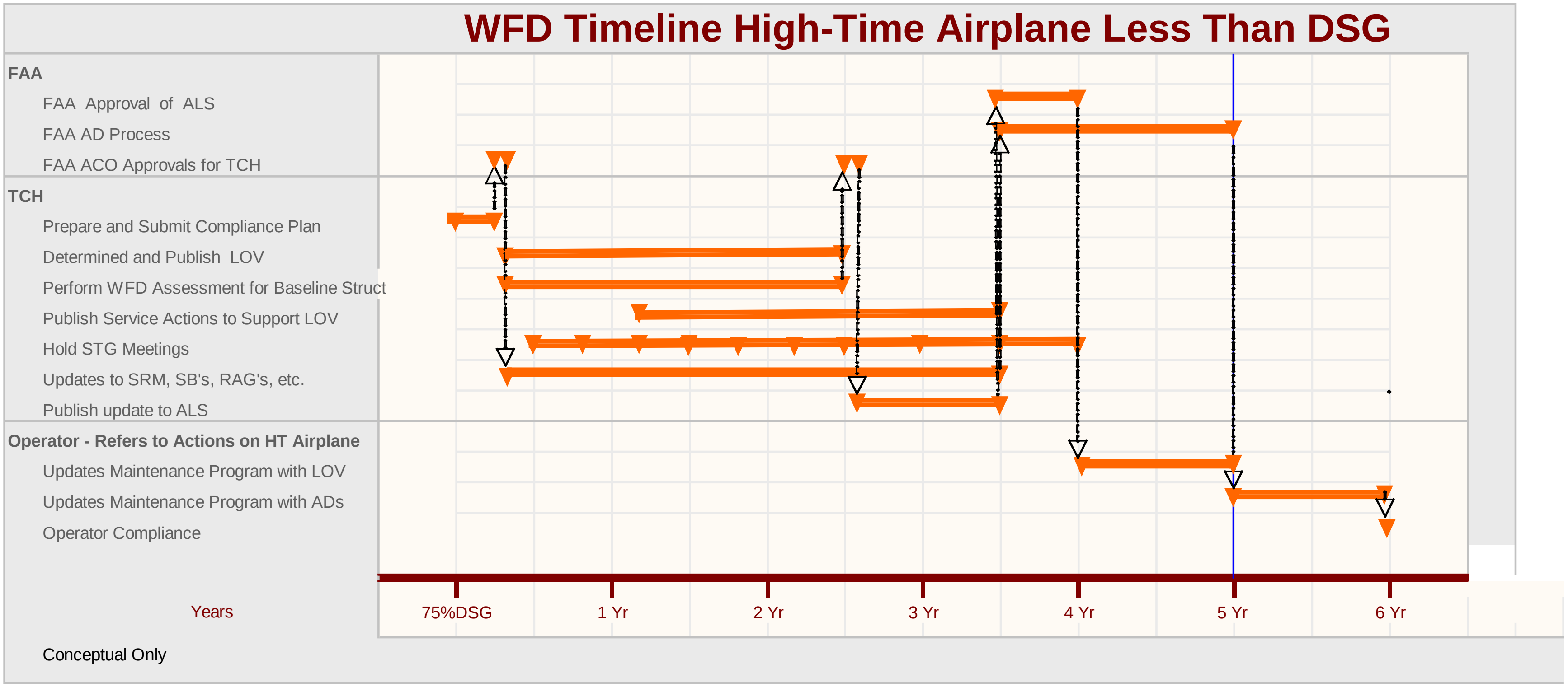


FIGURE 2.G.1 TIMELINE FOR WFD ACTION – HIGH-TIME AIRPLANE LESS THAN DSG ON RULE EFFECTIVE DATE

§25.WFD requires that the LOV be published as a revision to the ALS. This revision provides a notification to the operators of what will be required to operate the airplane beyond DSG, up to LOV. Unless further revised and accepted by the FAA, operation of the airplane beyond LOV would not be allowed.

A TCH may propose extensions to the LOV using the same approach required for establishing the original LOV.

d) Maintenance Actions to Support LOV

In addition to the determination of an LOV, the AAWG recommends the TCH determine what maintenance actions, if any, are needed to address areas susceptible to WFD to ensure the structure is free from WFD up to the LOV. These maintenance actions could be inspections and/or structural modification.

Publication of the maintenance actions should be by normal TCH processes including the publication of service bulletins. If the operator desires to operate the airplane past DSG up to the LOV, then they would need to comply with the maintenance actions as specified in the Airworthiness Directive (AD).

Any maintenance actions required should be given to the FAA for review and approval at the same time the LOV is submitted for approval. The FAA should review and process an ADon each maintenance action.

e) Updating TCH Publications to support airplane repairs - WFD

Published information such as SRMs and Service bulletins should be updated to incorporate maintenance actions that include consideration for the possible development of WFD. Such updates would include new or revised maintenance inspections and or replacement times. These documents would be provided to the FAA for approval at the same time the LOV and related maintenance actions are submitted for approval.

f) Operator Requirements

(i) Initial LOV

14 CFR 121.WFD and 129.WFD require the operator to incorporate a revision to their maintenance program that includes a LOV. This should be done within the period of time specified in the respective rule.

The FAA will publish airworthiness directives that are required to support the LOV.

(ii) Obtaining and incorporating subsequent LOVs and Maintenance actions.

If the operator desires to operate beyond the published LOV, then the operator should contact the TCH to investigate the possibility of a revised LOV. This contact should provide a minimum of four years in advance of the need for a revised LOV to provide sufficient time to prepare an amendment to the ALS. The ALS amendment should include the revised LOV and any maintenance actions required to support operation up to the revised LOV. This package should be developed using the procedures outline in Chapter 2 of the AC. Once approved by the cognizant FAA ACO, the TCH would make available the FAA approved amendment to the operator so that their maintenance program could be updated.

H. AAWG Discussion and Recommendations – Repairs and Alterations

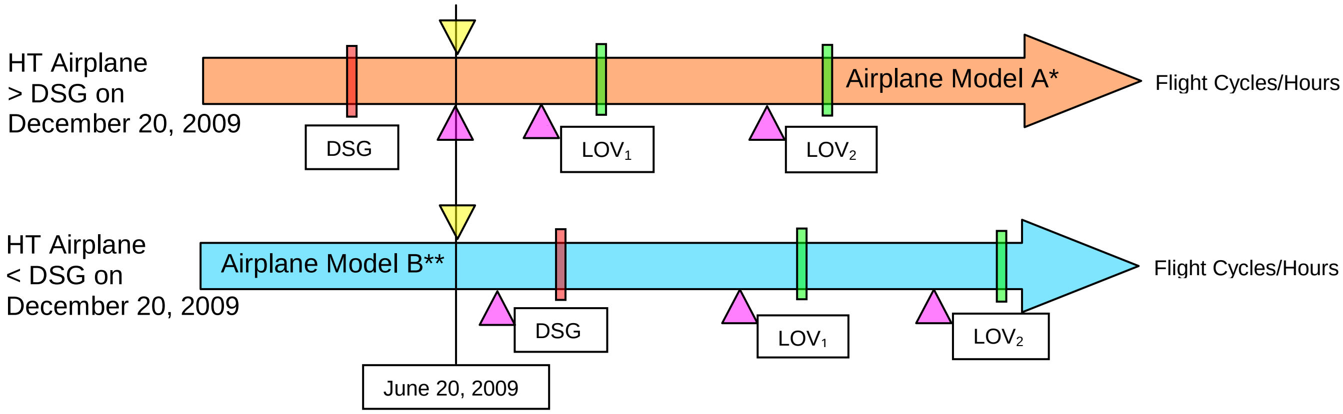
1) Introduction

Operator requirements to provide damage tolerance based maintenance instructions for repairs on fatigue critical structure were finalized in February 2005 when the Aging Airplane Safety Rule was published. This requires that repairs are assessed for damage tolerance and maintenance programs upgraded to ensure continued airworthiness of the repair. A companion rule, that would require the TCH to provide information to the operator on how to comply with the AASR, is in the final stages of rulemaking. This rulemaking will require the TCH to update all of his published documents that provide repair instructions to include damage tolerance based inspections for repairs on fatigue critical structure. This update is a significant cost item for the TCH that would need to be repeated if WFD requirements for repairs are mandated at a later time and would further impact operators who would be required to do a second detailed assessment of repairs. The AAWG's recommendations are therefore based on a balance of technical logistics for compliance, economic burden, and an increment gain in safety.

2) AAWG Position on Repairs

a) AAWG RECOMMENDATIONS ON REPAIRS:

The AAWG recommends that for repairs, WFD be addressed by the TCH updating their publications (SRMs, SBs, RAG, DT Compliance Document, etc…) to include WFD instructions by the same time they publish the WFD instructions for the baseline structure. If the TCH has a task to update his documents for DT, the AAWG suggests that the update for WFD occur at the same time for the reasons discussed below if the necessary data for WFD is available (e.g. baseline structure evaluation). The TCH should consider doing this with or without a rule requirement for WFD. Once published, the operators can revise their maintenance program to include instructions that all new or upgrading repair approvals to FCS structure susceptible to WFD will contain a WFD evaluation and approval. For airplanes where the published documents are already DT compliant, the update for WFD will be done before the high-time airplane reaches DSG. For these airplanes there is no intent to re-evaluate existing repairs for WFD unless a defined airworthiness issue exists. See Figure 2.2.



***   Models include A300, B 727, DC-8 etc.**
**** Models include A330, MD-11, B 767 etc.**

Compliance Data required to Support Operator Compliance to AASR

Compliance data required for WFD one and a half years before HT airplane exceeds DSG or LOV.
Exceptions:
(1) compliance data due June 20, 2009 if HT airplane has already exceeded DSG on December 20, 2009
(2) minimum period is 3.5 years after December 20, 2009 or one and a half years before DSG which ever is longer for those airplanes whose HT airplane has not exceeded DSG on December 20, 2009

FIGURE 2.H.1 – TIMING OF TCH COMPLIANCE DATA SUBMITTAL TO FAA

b) DISCUSSION OF AAWG RECOMMENDATIONS ON REPAIRS

The AAWG has reviewed the accident record and has observed that while there is a technical possibility of a WFD related accident involving a repair, there have been no accidents on record that have been attributed to WFD occurring in properly installed repairs.

The AAWG has therefore adopted a position that a review of repairs is necessary however that review should not occur separately from the DT review for Pre-amendment 45 airplanes. For all airplanes there is a requirement to provide DT data to the FAA by June 20, 2009. Most of the pre-amendment 45 airplanes are beyond DSG and as a result will have an immediate need for developing a WFD program when the WFD final rule is issued. Doing a separate updating of documents for WFD when the WFD rule is released is not economically justifiable.

For airplanes that are certified at Amendment 45 or beyond, many of these airplanes already have published documents that support the DT requirements. For airplanes that already have DT published documents, there will be a requirement to update the published information for WFD considerations before the high-time airplane reaches DSG.

If the AAWG recommendations are followed, the repairs surveys should begin after the documents are updated for both DT and WFD. In the case where surveys have already been done based on DT assessments alone, ***there is no intent to initiate retrospective requirements to re-review repairs for WFD, unless a specific airworthiness concern is identified.***

The recommended program has the following advantages:

1) There a significant economy of effort if the WFD analysis can be accomplished in the same time frame as the DT analysis;
    a. A small incremental increase in cost to accomplish the fatigue analysis will provide the most benefit to the industry with the least burden.
    b. A good portion of the repairs will benefit from an enhanced maintenance program that accounts for likely WFD in addition to the substantial safety net that the DT maintenance program provides.
2) It minimizes the risk of accomplishing a potential future review of repairs for WFD if the US or other international regulators decide to implement a repairs program for WFD at a later time.
3) ARAC has had very limited EASA participation on this matter and the AAWG cannot predict what EASA may decide to implement in the future. The AAWG is aware that EASA is in the process of codifying NPA 05-2006 that has substantially different repair requirements than the FAA is currently considering. The AAWG recommendations on WFD implementation has the least risk to the industry of requiring a subsequent repairs program that will require a second repairs survey and associated costs. This issue is addressed later in this section.
4) Existing repairs will be evaluated in the AASR surveys using the updated material and will be provided enhanced inspections based on WFD or be removed and replaced.

3) AAWG Position on Alterations

a) AAWG RECOMMENDATION ON ALTERATIONS:

The AAWG recommends that alterations for WFD be addressed in a two-step approach. New Alterations certified after the effective date of the §25.WFD should be handled by the change product rule 14 CFR 21.101 by making 14 CFR 25 Amendment 96 applicable. Existing alterations should be categorized into a few special types that detailed later in this report. Depending on category, these alterations should be reviewed in a Special Certification Review (SCR) with the outcome being a determination if additional action is required.

b) DISCUSSION OF AAWG RECOMMENDATIONS ON ALTERATIONS

The AAWG has reviewed the accident record and has observed that there have been no accidents on record that have been attributed to WFD occurring in properly installed alterations but it is recognized that this is a technical possibility. Nevertheless the AAWG believes that there are some categories of alterations that have the potential of developing WFD that should be reviewed such as, cargo door installations, large doublers, etc. The AAWG has categorized these alterations into a few special types that are detailed later in this report. Depending upon category, these alterations should be reviewed in a Special Certification Review (SCR) with the outcome being a determination if a WFD assessment is necessary in addition to the already required DT assessment.

The recommended program has the following advantages:

a. Existing alterations will also receive a DT evaluation and a maintenance program as a result of the AASR. This provides a substantial safety net even if it does not consider WFD.
b. For new Alterations, rulemaking is already in place via the change product rule (14CFR21.101) to address this issue. The AAWG believes this is sufficient. FAA enforcement will need a standardized approach for the various FAA ACO offices.
c. Consideration of any broader scope regarding existing alteration would create an industry burden due to lack of resources, guidance, and methodology.

The AAWG does not believe specific guidance in the form of an AC is warranted for alterations at this time for the reasons developed in Section 2.I below.

I. AAWG Position on Means and Methods for RAMs

The AAWG's understanding of the FAA's considerations for WFD of RAMs is that there are no plans to include requirements for WFD of RAMs in the initial issue of the rule. The FAA may decide at a later time to supplement the proposed WFD rule with requirements for RAMs. Nevertheless the FAA's tasking to the AAWG was to provide guidance on how an operator might be able to incorporate WFD considerations for RAMs. To this end, the AAWG provides the following information based on the following specific requests from the FAA on this subject.

a. Acceptable analytical methodology to be used by third parties to perform WFD evaluations of repairs and alterations.
b. Need for and scope of testing required to support WFD evaluations of new repairs and alterations.
c. Screening process for new repairs and alterations.
d. Approval process for new repairs and alterations.
e. Assessing need to evaluate existing repairs and alterations.
f. Where recommendations a.-e. should reside (e.g. new AC or existing) assuming the requirement to evaluate repairs and alterations is withdrawn from the WFD rule.

These issues are discussed below.

1) WFD Analysis Methodology for Repairs and Alterations

For third parties to evaluate their repairs and alterations for WFD and establish appropriate maintenance actions to preclude WFD, the AAWG has developed and is proposing a simplified methodology.

The methodology is intended to be conservative to compensate for its simplicity. The proposed methodology does not include the methodology to determine inspection intervals or inspection techniques. Developing such inspections requires an NDI knowledge base and infrastructure that, in general today, only TCHs possess. The only required maintenance action that results from the methodology is modification at a specified time in-service regardless of condition.

The methodology estimates the fatigue life of a structure susceptible to WFD, known as the $WFD_{(average\ behavior)}$. The time at which the structure must be modified is established by applying a factor to the $WFD_{(average\ behavior)}$ to achieve a certain level of reliability of not having an occurrence of WFD. Since the crack initiation phase represents a significant percentage of the $WFD_{(average\ behavior)}$, a crack initiation analysis could be used to conservatively estimate it. In order to do this, the analyst would need to know the stress applied to the detail under consideration, the fatigue life versus stress relation for the detail (e.g. SN curve), the Probability Density Function (PDF) for the fatigue life of the detail and the number of details in the component (e.g. repair) being assessed.

Even though this methodology is far less complex than the ones developed and applied by the TCHs, its application is intended for use by persons who have the minimum capability to carry out fatigue and damage tolerance analyses. Persons having the capability to apply this methodology may be limited outside TCH organizations today. This may represent an issue with respect to the total number of RAMs that can be addressed by third parties. Another major issue is the reliability associated with the fatigue endurance data used to perform the calculations (mean life for one detail, and associated PDF). Whereas conservative assumptions could be considered for PDF, the assessment of fatigue life may be linked to various parameters that are not necessarily available to third parties (e.g. material properties, fastener type and installation, clad/unclad, …).

This methodology is provided by the AAWG for use in determining the maintenance requirements for analysis of STC modifications with the following caveats. Viewing the resource requirements and the total number of alterations that need focused attention, the AAWG believes that a rule requiring the development of Maintenance actions for all STCs is not justifiable. As discussed in Section 2.H.3 of this report, the FAA should begin Special Certification reviews of these alterations and within the context of the review oversee the application of the methodology contained in the Appendix D.

2) Need For And Scope Of Testing Required To Support WFD Evaluations Of New Repairs And Alterations

The applicant should have analysis procedures that are supported by test evidence. This fact should be developed in discussions between the applicant and the regulator.

The applicant may be expected to conduct tests (both static and fatigue) if there is not an adequate history of test evidence.

3) Screening of RAMs for Susceptibility to WFD

Repairs and alterations affecting fatigue critical structure either already have or will have a damage tolerance evaluation to provide a DT based maintenance requirements (Certification, RAP, AASR). The AAWG discussion of WFD for repairs and alterations has been to determine if there are any of these repairs or alterations which have the potential to cause WFD to occur on the repaired or altered structure.

a) Repairs

If the FAA chooses to mandate a WFD program for repairs the AAWG concluded that a screening process would be necessary to determine which repairs need a further consideration for WFD. The AAWG has concluded that this screening process would eliminate a substantial number of repairs from requiring further WFD assessment. This screening approach would be especially helpful since few entities have the knowledge or data to perform a WFD analysis.

The screening process is based on the following considerations:

- repair type (skin or web vs stiffening members);
- location;
- adjacency to baseline WFD susceptible FCS;
- adjacency to other repairs; and,
- the size of the repair.

The expectation of the AAWG was that each manufacturer could provide the necessary information to the operators for each model fleet during STG meetings. This would enable operators conducting surveys or reviews of repairs would be able to determine which of these repairs would need further WFD assessment or analysis.

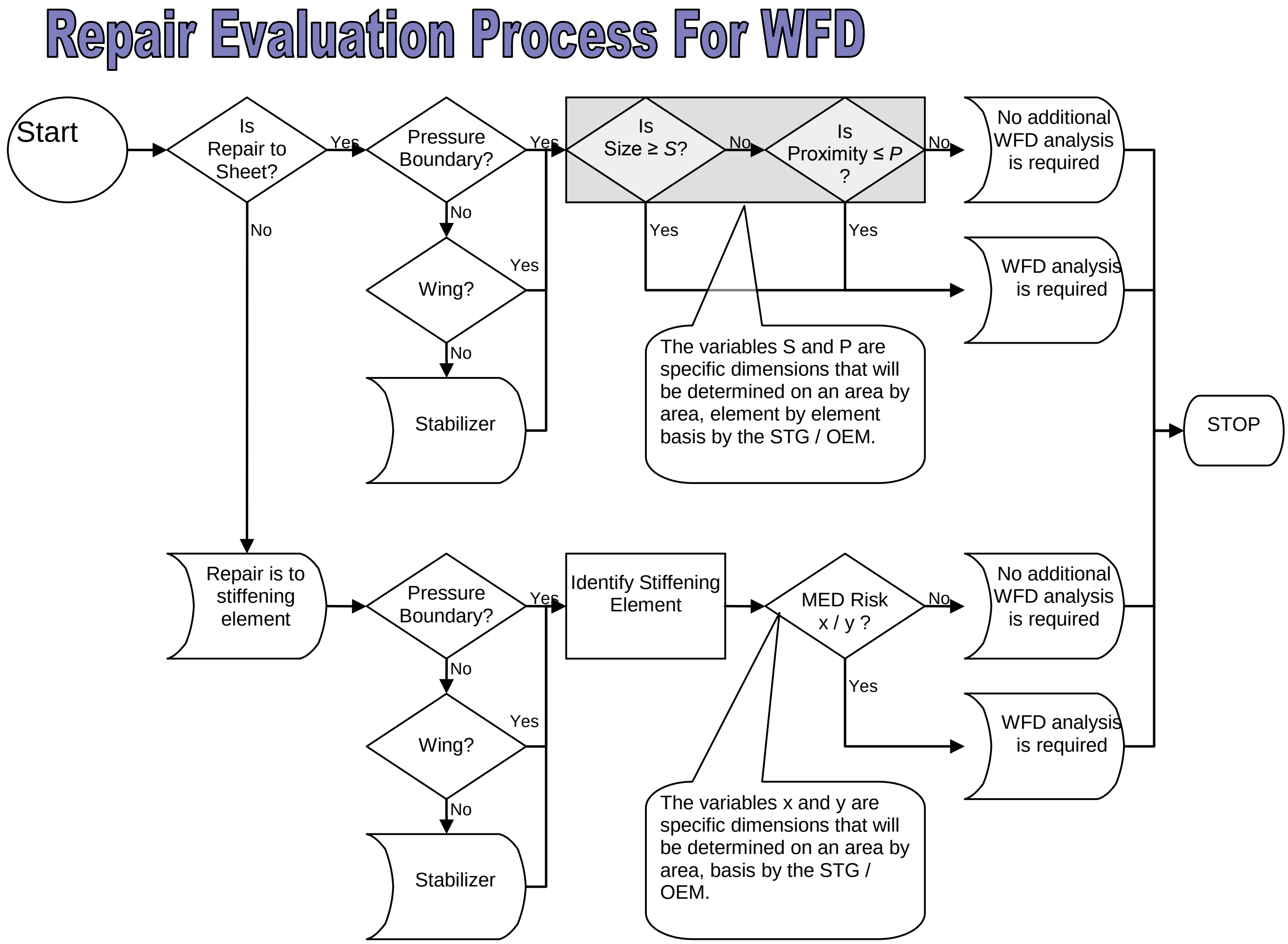


FIGURE 2.I.1 – WFD SCREENING FOR REPAIRS

This process is a detailed description of the WFD filter for repairs. The process can be looked at in sections:

- The first step of the process separates the repairs into types.

  The “Sheet” decision block would be assessed as yes for any repair to a skin or pressurized or stressed web.

  The “stiffening element” decision block would be assessed as yes for any repair to a stringer, longeron, frame, bulkhead stiffener, floor beam, chord, etc.
- The next step categorizes the repair based on its location on the aircraft. These elements are self explanatory.
- The next section does the final filter based on multiple site damage (MSD) or multiple element damage (MED) potential.

For sheet repairs, MSD potential is accounted for by ensuring the size of a repair is less that what is critical for WFD, and by ensuring there is a minimum spacing between the subject repair and any adjacent repairs and WFD susceptible fatigue critical baseline structure.
The variables S and P are specific dimensions that will be determined on an area by area, element by element basis by the STG / OEM. A critical size dimension on the wing may be different than for the fuselage, and a critical size dimension for a stabilizer web may be different than that for the wing. The same analogies hold true for proximity dimensions. The size and proximity evaluations will be done for each repair based on the critical dimensions for S and P.

For stiffening element repairs, MED potential is accounted for by ensuring no more than x out of any y consecutive elements are repaired in the same area. The variables x and y are specific quantities that will be determined on an area by area basis by the STG / OEM. The number of consecutive wing stringers that can be repaired without affecting WFD may be different than the number of consecutive bulkhead stiffeners that can be repaired. The MED evaluations will be done for each repair based on the critical dimensions for x and y.

While certain decisions in the flow chart may result in other steps being omitted, if the end point of the processes indicates the need for a WFD analysis, all pertinent data shall be gathered. This includes:

- Element description,
- Location of repair including enough reference points to positively identify location,
- Size of repair,
- Proximity of repair to WFD susceptible fatigue critical baseline structure and/or other repairs,
- Number of adjacent repairs, and
- Sketch of repair with above details provided.

b) Alterations

As stated in Paragraph 2.H.3, the AAWG concluded that a screening process would be necessary to determine which existing alterations need a further consideration for WFD. This screening process would eliminate a substantial number of existing alterations from requiring further consideration.

Alteration screening for WFD includes the following considerations to determine alterations that may be susceptible to WFD. Does the alteration affect several stringer or frame bays and:

a) Does the alteration either affect or create fatigue critical structure; and/or,
b) Does the alteration affect a baseline program intended to preclude WFD?

For example, installation of the following general types of alterations may qualify:

a) Fuselage cutouts (passenger entry doors, emergency exit doors or crew escape hatches, fuselage access doors, and cabin window relocations); and
b) Passenger-to-freighter conversions (including addition of main deck cargo doors).

The AAWG applied this screening criteria to a listing of 642 STC's submitted by Eleven US and Foreign operators to determine the potential impact of 14 CFR 121.WFD and 129.WFD, it was determined that 14 STC's or 2.18% out of the 642 STC's surveyed would require assessment for WFD. This survey is provided in Appendix G. The following STCs were noted:

STC Number	Description	Airplane Model(s)	# Airplanes Affected	Airplane Cert. Basis	Comments
SA3968SW-D	Inboard Refueling - Improved Fuel Mixing	DC9-82/83	231	10	Wing Rib Cut-outs for Piping Changes
SA2628SW-D	Install Mid Cabin Lavatories (Fuselage Dblr)	DC10-10	~45	22	External Reinforcement Doubler
SA1802SO	Instl Cargo Door,Restraint Blkhd,Heavy Floor, Class E Compartment, Pallet Restraint Syst.	DC8	4	CAR 4b	
ST01670AT-D	Installation of Main Deck & Lower Lobe Floor Mod & 9G Restraint Systems	767	24	45	
ST00788SE	Installation of a LiveTV Satellite Television System.	A319-111, 112 A318-111	43	FAR 25-86	
SA1767SO	727-100/-200 Main Cargo Door Inst.	B 727-100, 200 series	98		
ST00312AT	Modification to allow passenger to freighter conversion.	DC-10-10			
ST00100NY	A310 P-F Conversion	Airbus A310			
ST01438CH	Inst. Of NASI Vent Door System	B727			
SA1474SO	Installation of Winters Auxilliary Fuel Tanks	B727-2S2F	1		Tank mounting structure span multiple circumferential frames and floor beams.
ST00252WI	Conversion-PAX Aircraft to Special Freighter	747-200B	2	Pre-45	JAPAN STC-2-HQT
	P-F Cargo Door Installation	747			
ST00255WI-D	Conversion of a passenger airplane to a main deck side cargo door dedicated special freighter	747			
SA553NE	PATS Installation of 425 or 500 Gallon Aux. Fuel System in Aft Cargo Compartment	737-300/-400	65	A16WE	Tank mounting structure span multiple circumferential frames and floor beams.

Table 2.I.1 – Significant STCs

4) Approval Process For New Repairs And Alterations.

All new repairs and alterations installed on FCS on airplanes operated beyond the DSG require an assessment for WFD after the effective date of the WFD rule. The approval process for WFD assessment of repairs should use the same 3 stage approach established for the DTA provisions of the AASR when required. New alterations should be assessed for WFD at time of certification.

5) Assessing Need To Evaluate Existing Repairs And Alterations.

a) Repairs

In the development of the fuselage pressure boundary repair assessment program required under §121.370, the industry conducted a statistically significant review of repairs on airplanes. That survey and subsequent repair evaluations revealed that no repairs on any airplane surveyed required removal because of a structural issue. The conclusions reached indicated that the industry as a whole has a competent program where repairs are evaluated and replaced, on condition through the routine maintenance programs. It was therefore established that repairs installed on airplanes had a reasonable expectation of reaching the DSG of the airplane without supplemental inspections like those required by the SSID/ALS programs. Routine maintenance programs apparently are providing adequate coverage up to the DSG.

As a result of these studies, the industry proposed and the FAA accepted a program for the fuselage pressure boundary repairs program that began at approximately 75% DSG and required full incorporation of the program by 100% DSG. These programs were directed toward considering the damage tolerance characteristics of the repair.

For substantial technical reasons, the AAWG believes that the prospect of developing WFD in repairs will happen later in the life of the airplane as opposed to cracks developing from the local damage considered in the DTA assessment. With this knowledge, the AAWG is recommending that the WFD aspects of a published repair that might develop WFD should be done at the same time as the assessment of the DTA characteristics. The resulting maintenance program recommendations for the repair will represent a composite of both the DTA assessment and the WFD assessment.

b) Alterations

The AAWG believes that there are certain classes of alterations that require a high level of scrutiny as compared to other alterations. While the current proposed rule would focus activity on all alterations, the AAWG believes that this would create an unnecessary burden on the industry that would not contribute to continued airworthiness. The AAWG has identified certain alterations that require the additional level of scrutiny. It is suggested that the FAA conduct SCR for each of these categories of Alterations to establish any additional actions required for continued airworthiness. The AAWG believes that if a rule is promulgated for alterations, the focus of that rule should be on future alterations rather than having any retrospective considerations.

6) Where Recommended Guidance For RAMs Should Reside.

If the FAA promulgates new rulemaking for assessment of RAMs for WFD, the AAWG recommends that guidance information should be placed in an amended AC 120-WFD.

J. Consequences Of Other Approaches For RAMs - Potential Impact of FAA Approach to the Industry

If the FAA is not able to align the timing of the WFD requirements with the AASR timelines, additional, significant, work will be required.

The TCH may be required to update the model specific in-service documents (SB's & SRM) twice if the rules are not aligned. The update of published documents is a significant task involving justification, technical publication and the approval of the documents. Updating the documents for WFD when the documents are being updated DT is only a relatively small additional workload compared to doing WFD and DT at the same time.

Separation of the AASR and WFD activities may also require operators to perform their tasks twice. They may need to make a separate repair assessment for DT and WFD, installed two separate SRM updates and update their maintenance program twice. This could be done by the operator in one operation similar to the TCH task with relative small additional workload.

The FAA may face a similar resource issues if the updates are performed at separate times.

In addition to the labor cost, there will be a significant additional cost because airplanes may need to be removed from service twice to conduct surveys and possibly to perform specific maintenance tasks on RAMs.

K. STG Activities

STG should be formed for each model for which the fleet leader is within or above75% DSG. The STG should assist the TCH in determining the LOV for the airplane. They should also participate in reviewing the proposed maintenance actions required to support operation of the airplane to the proposed LOV and provide technical and economic input to the overall process. The following compliance tables should assist the STG in their activities.

Table 2.K.1 – Type Certificate Holder Compliance Table

For
AASR and WFD NPRMs

<table>
<tr><th rowspan="2">Entity</th><th rowspan="2">Cert Category</th><th rowspan="2">Regulation</th><th colspan="3">Date or Event*</th></tr>
<tr><th>December 20, 2010</th><th>HT Airplane Reaches DSG</th><th>Extend LOV</th></tr>
<tr><td rowspan="6">TCH</td><td rowspan="2">Pre Admt 45</td><td>DTA</td><td>• DTA Compliance Document
• DTA Compliant SRM/SB</td><td>N/A</td><td>N/A</td></tr>
<tr><td>WFD</td><td>• LOV
• WFD Compliant SRM/SB
• SB Information to FAA for AD action</td><td>N/A</td><td>Baseline LOV Extension Justification</td></tr>
<tr><td rowspan="2">Admt 45 to 95</td><td>DTA</td><td>• DTA Compliance Document
• DTA Compliant SRM/SB</td><td>N/A</td><td>N/A</td></tr>
<tr><td>WFD</td><td>N/A</td><td>• LOV
• WFD Compliant SRM/SB
• SB Information to FAA for AD action</td><td>Baseline LOV Extension Justification</td></tr>
<tr><td rowspan="2">≥ Amdt 96</td><td>DTA</td><td>N/A</td><td>N/A</td><td>N/A</td></tr>
<tr><td>WFD</td><td>N/A</td><td>LOV plus supportive maintenance actions to FAA</td><td>Baseline LOV Extension Justification</td></tr>
</table>

Note: The Documents or data items in this table must be in existence on these dates or events according to the schedule presented AC 120-AAWG. In some cases, these documents must be published and made available substantially before these dates to facilitate operator and third party compliance.

Table 2.K.2 – Supplemental Type Certificate Holder Compliance Table

For
AASR and WFD NPRMs

Entity	**Cert Category**	**Regulation**	**Date or Event***		
			December 20, 2010	**HT Airplane Reaches DSG**	**Extend LOV**
STC Holder	Pre Admt 45	DTA	• DTA Compliance Document • DTA Compliant SRM/SB	N/A	N/A
		WFD	Unclear at this time – STC Holders have no means to comply**	N/A	Unclear at this time – STC Holders have no means to comply**
	Admt 45 to 95	DTA	• DTA Compliance Document • DTA Compliant SRM/SB	N/A	N/A
		WFD	N/A	Unclear at this time – STC Holders have no means to comply**	Unclear at this time – STC Holders have no means to comply**
	≥Amdt 96	DTA	N/A	N/A	N/A
		WFD	N/A	N/A	Validate STC for extension

Notes: * The Documents or data items in this table must be in existence on these dates or events according to the schedule presented AC 120-AAWG. In some cases, these documents must be published and made available substantially before these dates to facilitate operator compliance.

***** The FAA does no have guidelines to enable third parties to perform the analysis therefore unless some simplified analysis method is presented there will be no requirement.***

Table 2.K.3 – Operator Compliance Table

For
AASR and WFD NPRMs

Entity	**Cert Category**	**Regulation**	**Date or Event***		
			December 20, 2010	**HT Airplane Reaches DSG**	**Extend LOV**
Operator	Pre Admt 45	DTA	OIP Incorporated and PMI Approval	N/A	N/A
		WFD	Compliance with FAA issued ADs	N/A	Compliance with FAA issued ADs
	Admt 45 to 95	DTA	OIP Incorporated and PMI Approval	N/A	N/A
		WFD	N/A	Compliance with FAA issued ADs	Compliance with FAA issued ADs
	≥Amdt 96	DTA	N/A	N/A	N/A
		WFD	N/A	Compliance with FAA issued ADs	Compliance with FAA issued ADs

***Note: The Documents or data items in this table must be in existence on these dates or events according to the schedule presented AC 120-AAWG. In some cases, these documents must be available substantially before these dates to facilitate PMI/FAA Approval.**

For WFD, the operator must comply with the FAA issued ADs.

Appendix A: List of References

The following is provided as a means to access current rules and regulations together with previous ARAC Recommendations from the AAWG. Documents noted by an (*) are available at the following web site.

http://www.faa.gov

A. REGULATIONS.

The regulatory basis of this AC is 14 CFR part 21, Certification Procedures for Products and Parts; 14 CFR part 25, Airworthiness Standards: Transportation Category Airplanes; 14 CFR part 43, Maintenance, Preventive Maintenance, Rebuilding, and Alteration; 14 CFR part 119, Certification: Air Carriers and Commercial Operators; 14 CFR part 121, Operating Requirements: Domestic, Flag, and Supplemental Operations; Part 121, Subpart G, Manual Requirements; 14 CFR part 129, Foreign Air Carriers and Foreign Operators of U.S.-Registered Aircraft Engaged in Common Carriage.

1. § 21.3, Reporting of failures, malfunctions, and defects.
2. § 21.21, Issue of type certificate: normal, utility, acrobatic, commuter, and transport category aircraft; manned free balloons; special classes of aircraft; aircraft engines; propellers.
3. § 21.50, Instructions for continued airworthiness and manufacturer's maintenance manuals having airworthiness limitations sections.
4. § 21.99, Required design changes.
5. § 21.97, Classification of changes in type design.
6. § 21.101, Designation of applicable regulations.
7. § 21.113, Requirements of supplemental type certificate.
8. § 25.571, Damage-tolerance and fatigue evaluation of structure.
9. § 25.WFD, Widespread fatigue Damage
10. § 25.1529, Instructions for continued airworthiness.
11. § Appendix H to part 25, Instructions for Continued Airworthiness.
12. § 43.13, Maintenance
13. § 43.16, Airworthiness limitations.
14. § 121.153, Aircraft requirements: General.
15. § 121.363, Responsibility for airworthiness.
16. § 121.367, Maintenance, preventive maintenance, and alteration programs.
17. § 121.373, Continuing analysis and surveillance.

18. § 121.703, Mechanical reliability reports.
19. § 121.WFD, Widespread fatigue damage.
20. § 129.11, Operations specifications.
21. § 129.14, Maintenance program and minimum equipment list requirements for U.S.-registered aircraft.
22. § 129.WFD, Widespread fatigue damage.
23. § 25.AASR DAH Rule

B. DOCUMENTS.

The following related documents are provided for information purposes and are not necessarily directly referenced in this AC.

1. Advisory Circulars. An electronic copy of the following ACs can be downloaded from the Internet at http://www.airweb.faa.gov/rgl. A paper copy may be ordered from the U.S. Department of Transportation, Subsequent Distribution Office, M-30, Ardmore East Business Center, 3341 Q 75th Avenue, Landover, MD 20785.

(a) AC 20-107A, “Composite Aircraft Structure”
(b) AC 21.101-1, “Establishing the Certification Basis of Changed Aeronautical Products”
(c) AC 25.19, “Certification Maintenance Requirements”
(d) Proposed AC 25.XX, “Subpart I, Continued Airworthiness and Safety Improvements”
(e) Proposed AC 25.571-1X, “Damage Tolerance and Fatigue Evaluation of Structure”
(f) Proposed AC 25.1529-1X, “Instructions for Continued Airworthiness of Structural Repairs on Transport Airplanes”
(g) AC 91-56A, “Continuing Structural Integrity Program for Large Transport Category Airplanes”
(h) AC 91-60, “The Continued Airworthiness of Older Airplanes”
(i) AC 120-16D, “Air Carrier Maintenance Programs”
(j) AC 120-73, “Damage Tolerance Assessment of Repairs to Pressurized Fuselages”
(k) Proposed Advisory Circular 120-XX, Damage Tolerance Inspections for Repairs, Published for comment April 21, 2006
(l) AC 121-22A, “Maintenance Review Board Procedures”
(m) Draft AC 120-YY, Widespread Fatigue Damage on Metallic Structure, Published for comment May 12, 2006.

2. FAA Policy. An electronic copy of the following Policy Statement can be downloaded from the Internet at http://www.airweb.faa.gov/rgl. A paper copy may be ordered from the Federal Aviation Administration, Transport Airplane Directorate, Transport Standards Staff, Standardization Branch, ANM-113, 1601 Lind Avenue SW., Renton, WA 98055-4056.

(a) PS-ANM110-7-12-2005, Policy Statement, "Safety – A Shared Responsibility - New Direction for Addressing Airworthiness Issues for Transport Airplanes," issued July 6, 2005, effective July 12, 2005.

3. Federal Aviation Administration Final Rules. An electronic copy of the following Final Rule can be downloaded from the Internet at http://www.airweb.faa.gov/rgl.

(a) The "Fuel Tank Safety Rule Compliance Extension and Aging Airplane Program," (69 FR 45936, dated July 30, 2004).

(b) "14 CFR Parts 119, 121, 129, 135, and 183 Aging Airplane Safety; Final Rule," (70 FR 5518, dated February 2, 2005)

4. FAA Orders.

(a) Order 8110.54, "Instructions for Continued Airworthiness"

(b) Proposed Order 8300.10 Rev. XX, "Airworthiness Inspectors Handbook"

(c) Proposed Order 8110.XX, "Continued Airworthiness and Safety Improvements Responsibilities, Requirements, and Contents for Design Approval Holders"

5. Related Documents.

(a) "Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Airplane Fleet," Revision A, dated June 29, 1999 (A report of the Airworthiness Assurance Working Group for the Aviation Rulemaking Advisory Committee Transport Aircraft and Engine Issues.)

Note: Certain terminology has changed in this AC from the above noted report. Fatigue crack initiation is now inspection start point. Point of WFD is now structural modification point.

(b) "Widespread Fatigue Damage Bridging Task Multiple Element Damage", dated July 23, 2003 (A report of the Airworthiness Assurance Working Group for the Aviation Rulemaking Advisory Committee's Transport Aircraft and Engine Issues Group.)
(c) Final Report of the AAWG – Continued Airworthiness of Structural Repairs*
(d) A Report of the AAWG – Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Airplane Fleet, Draft NPRM and Advisory Information. Dated June 2001.*
(e) A Report of the AAWG - Recommendations For Regulatory Action To Enhance Continued Airworthiness Of Supplemental Type Certificates*
(f) Repair Assessment Guidelines, FAA Approved Model Specific Guideline Documents**
(g) FAA Approved Model Specific Supplemental Inspection Documents**
(h) ATA Report 51-93-01 - Structural Maintenance Program Guidelines For Continuing Airworthiness***

(i) A Report to the AAWG - Structures Task Group Guidelines Document, June 1996*
(j) FAA Notice of Proposed Rule Making, Aging Aircraft Program: Widespread Fatigue Damage, Docket Number FAA-2006-24281, Published April 18, 2006.
(k) FAA Notice of Proposed Rule Making, Damage Tolerance Data for Repairs and Alterations, Docket Number FAA-2005-21693, Published April 21, 2006.
(l) Federal Register/ Vol. 67, No. 235 / Friday, December 6, 2002 / Rules and Regulations Aging Airplane Safety
(m) Aviation Rulemaking Advisory Committee; Transport Airplane and Engine Issues—New Task Federal Register / Vol. 69, No. 93 / Thursday, May 13, 2004 / Notices 26641
(n) A Report of the AAWG – Recommendations Concerning ARAC Tasking FA Doc. 04-10816 RE: Aging Airplane Safety Final Rule 14 CFR 121.370a and 129.16. Published October 28, 2005.
(o) A Report of the AAWG – Recommendations Concerning ARAC Tasking FA Doc. 04-10816 RE: Aging Airplane Safety Final Rule 14 CFR 121.370a and 129.16. Task 2 Closeout, dated 12 May 2006.

* Documents are available at the following web site. http://www.faa.gov
** Various manufacturers publish these documents. Please contact those manufacturers to determine the general availability of the documents.
*** Please contact the ATA.

Appendix B: Copy of FAA Tasking Notice

Federal Register / Vol. 69, No. 93 / Thursday, May 13, 2004 / Notices

Pages 26641 through 26644

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

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

AGENCY: Federal Aviation Administration (FAA), DOT.

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

SUMMARY: The FAA assigned the Aviation Rulemaking Advisory Committee a new task to develop guidance that will support industry compliance with the Aging Airplane Safety Final Rule requirements that relate to supplemental structural inspections. This new tasking will also address certain aspects of recommendations made during a previous ARAC tasking related to widespread fatigue damage. This notice is to inform the public of this ARAC activity.

FOR FURTHER INFORMATION CONTACT: Mike Kaszycki, Federal Aviation Administration, Transport Standards Staff, 1601 Lind Avenue, SW., Renton, Washington 98055–4056, *mike.kaszycki@faa.gov.*

SUPPLEMENTARY INFORMATION:

Background

The FAA established the Aviation Rulemaking Advisory Committee to provide advice and recommendations to the FAA Administrator on the FAA's rulemaking activities with respect to aviation-related issues. This includes obtaining advice and recommendations on the FAA's commitments to harmonize Title 14 of the Code of Federal Regulations (14 CFR) with its partners in Europe and Canada.

Airplane Applicability of Tasking

This new tasking shall apply to transport category airplanes with a type certificated passenger seating capacity of 30 or greater, or a maximum payload capacity of 7,500 pounds or greater, operated under part 121 or under part 129 (U.S. registered airplanes).

Statement of Tasking

There are four major tasks to be completed under this tasking:

Task 1.—Repairs to Baseline Primary Structure and Repairs to Alterations and Modifications

Draft an Advisory Circular (AC) that contains guidance to support the following two paths of compliance with §§ 121.370a and 129.16 of the Aging Airplane Safety Interim Final Rule (AASIFR):

1. *Damage-tolerance-based inspection program developed by part 121 and 129 certificate holders:* Develop guidelines and procedures that will enable part 121 and 129 certificate holders to develop a damage-tolerance-based inspection program that addresses repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

2. *Model specific damage-tolerance-based inspection program:* Develop Guidance that can be used by Type Certificate (TC) holders, Supplemental Type Certificate (STC) holders, and Structural Task Groups to support the development of a model specific damage-tolerance-based inspection program. The model specific damage-tolerance-based inspection program will address repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The developed model specific inspection program will support part 121 and 129 certificate holders' compliance with the AASIFR.

A written report will also be submitted that includes an action plan for the implementation of the recommendations of task 1 that will be addressed in task 4 below. The report is to be submitted to the Aviation Rulemaking Advisory Committee (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.

In the process of drafting the AC, the ARAC should assess the effectiveness of AC 91–56B to provide guidance to TC and STC holders for developing damage-tolerance-based inspections and procedures for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The ARAC should do the following:

• Assess the effectiveness of AC 91– 56B to support Industry compliance with the AASIFR with respect to repairs.

• Document any improvements to the AC that would provide better direction with respect to the guidance for TC and STC holders in their development of damage-tolerance-based inspections and procedures for repairs.

The ARAC is requested to validate that the guidance material in the new AC will result in programs that provide a high degree of autonomy for part 121 and 129 certificate holders while supporting compliance with the AASIFR. In order to determine a rational approach for addressing repairs to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, and are not currently covered by a mandated program, the AC should provide guidance to the part 121 and 129 certificate holders and to the type certificate holder to address the seven issues listed below.

1. The significance of the airplane certification amendment level in providing direction for the development of damage tolerance inspections and methods for repairs.

2. The degree to which Supplemental Structural Inspection Documents/ Programs (SSID/P) or equivalent documents/programs provide direction to repair the structure using damage-tolerance-rated repairs. The assessment should apply to SSID/Ps or equivalent documents/programs developed for 14 CFR part 25 pre-amendment 25–45 transport airplane models having a maximum gross takeoff weight of 75,000 lbs or greater. The following should be identified:

• Areas of aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by SSID/ Ps or equivalent documents/programs

• Significant assumptions applied in developing SSID/Ps or equivalent documents/programs

• Any significant issues in the implementation of the requirements of SSID/Ps or equivalent documents/ programs

• Data from SSID/Ps or equivalent documents/programs that would be useful in supporting this new tasking

3. The degree to which an applicable airplane model's Airworthiness Limitations Section (ALS) provides direction to repair the structure using damage-tolerance-rated repairs. This assessment should apply to damage-tolerance-based inspection programs/ data developed for 14 CFR part 25 amendment 25–45 or later transport airplane models having a maximum gross takeoff weight of 75,000 lbs or greater. The following should be identified:

• Areas of aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by a damage-tolerance-based inspection program/data

• Any significant issues in the implementation of the requirements of the damage-tolerance-based inspection programs/data

• Data from the damage-tolerance-based inspection programs that would be useful in supporting this new tasking

4. The degree to which existing Repair Assessment Guideline documents developed for §§ 121.370 and 129.32 provide damage-tolerance-based inspections for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The assessment should identify the following:

• Areas of the aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure, which are not covered by these documents

• Data from these documents that would be useful in supporting this new tasking

5. Identify the issues/difficulties industry has encountered with establishing damage-tolerance-based inspections and procedures for repairs as required by various FAA approaches in issuing SSIP airworthiness directives (*e.g.*, 727/737 AD 98–11–03 R1, AD 98– 11–04 R1 verses other SSIP AD approaches like the 747). The assessment should identify the following:

• Comparison of approaches with pros and cons for each approach

• Data from these documents that would be useful in supporting this new tasking

6. Assess the extent to which Structural Repair Manuals (SRM) provide damage-tolerance-based inspections for repairs made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

7. Assess the need to include damage-tolerance-based inspections and procedures in TC and STC Holder issued Service Bulletins (SB) that provide repair instructions for aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

Task 2.—Alterations and Modifications to Baseline Primary Structure, Including STCs and Amended Type Certificates (ATCs)

Prepare a written report assessing how an operator would include damage tolerance-based inspections and procedures for alterations and modifications made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. This assessment would include, but is not limited to, alterations and modifications performed under an STC, ATC, FAA field approval (*e.g.*, FAA form 337) and/or FAA approved TC holder design data. The report should include a recommendation on the best means to develop damage-tolerance-based inspections and procedures for these alterations and modifications and the applicability of AC 91–56B. The ARAC should assess the effectiveness of AC 91–56B to provide guidance to STC holders for developing damage-tolerance-based inspections and procedures for alterations and modifications. The ARAC should do the following:

• Assess the effectiveness of AC 91– 56B to support Industry compliance with the AASIFR with respect to alterations and modifications.

• Document any improvements to the AC that would provide better direction with respect to the guidance for STC holders in their development of damage-tolerance-based inspections and procedures for alterations and modifications.

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 should also provide a recommendation on the means of compliance provided by the AC developed in Task 1 in regards to repairs installed on STC or ATC approved alterations and modifications. 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 (FAA concurrence is necessary to ensure actions will support industry compliance with the AASIFR).

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.

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 the 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.

Schedule

The tasking will be performed in two phases. In Phase 1, the ARAC will provide to the FAA the results of Tasks 1 through 3. Phase 1 should be accomplished by December 16, 2005. In Phase 2, the Structures Task Groups, under the direction of the ARAC, should produce the model specific guidance material, Task 4, using the guidelines and procedures of the AC produced in Phase 1. The ARAC will be responsible for coordinating and overseeing the STG's application of the AC. Phase 2 documents should be completed by December 18, 2009.

ARAC Acceptance of Task

ARAC accepted the task and assigned the task to the Airworthiness Assurance Working Group, Transport Airplane and Engine Issues. The Structural Task Groups (STG) composed of type certificate and part 121 and 129 certificate holders familiar with the specific model aircraft will support the working group. The working group will serve as staff to ARAC and assist in the analysis of the assigned task. ARAC must review and approve the working group's recommendations. If ARAC accepts the working group's recommendations, it will forward them to the FAA.

Working Group Activity

The Airworthiness Assurance Working Group must comply with the procedures adopted by ARAC. As part of the procedures, the working group must:

1. Recommend a work plan for completion of the task, including the rationale supporting such a plan for consideration at the next meeting of the ARAC on transport airplane and engine issues held following publication of this notice.

2. Give a detailed conceptual presentation of the proposed recommendations prior to

proceeding with the work stated in item 3 below.

3. Draft the appropriate documents and required analyses and/or any other related materials or documents.

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

Participation in the Working Group

The Airworthiness Assurance Working Group will be composed of technical experts having an interest in the assigned task. A working group member need not be a representative or a member of the full committee. If you have expertise in the subject matter and wish to become a member of the working group you should write to the person listed under the caption **FOR FURTHER INFORMATION CONTACT** expressing that desire, describing your interest in the task, and stating the expertise you would bring to the working group. We must receive your request to participate no later than May 28, 2004. The assistant chair, the assistant executive director, and the working group chair will review your request and will advise you whether your request is approved. If you are chosen for membership on the working group, you must represent your aviation community segment and actively participate in the working group (*e.g.*, attend all meetings, provide written comments when requested to do so, *etc.*). You must also devote the resources necessary to support the working group in meeting any assigned deadlines. You must keep your management chain and those you may represent advised of working group activities and decisions to ensure that the proposed technical solutions don't conflict with your sponsoring organization's position when the subject being negotiated is presented to ARAC for approval.

Once the working group has begun deliberations, members will be added or substituted only with the approval of the assistant chair, the assistant executive director, and the working group chair.

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

Meetings of the ARAC will be open to the public. Meetings of the 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. The FAA will make no public announcement of working group meetings.

Issued in Washington, DC, on May 4, 2004.

Anthony F. Fazio,

Executive Director, Aviation Rulemaking Advisory Committee.

[FR Doc. 04–10816 Filed 5–12–04; 8:45 am]

BILLING CODE 4910–13–P

Appendix C: Draft AC 120-WFD

Subject: WIDESPREAD FATIGUE DAMAGE – Baseline Structure	**Date:** Draft **Initiated by:**	**AC No:** 120-WFD Rev 12 Mar 22, 2007

1. PURPOSE.

This advisory circular (AC) provides guidance to Type Certificate Holder (TCH) on establishing Limits of Validity (LOV) for certain transport category airplanes and provides guidance for establishing maintenance actions to preclude the occurrence of widespread fatigue damage (WFD) prior to an aircraft reaching the LOV. In addition, guidance is provided to the operators on how an operator adopts an LOV into their maintenance programs.

2. APPLICABILITY.

a. This guidance is for TCHs and operators of transport category airplanes that:

1. Were certificated under the requirements of Civil Air Regulations (CAR) 4b or 14 Code of Federal Regulations (CFR) part 25; and

   (1) Have a maximum takeoff gross weight (MTGW) greater than 75,000 pounds; or

   (2) Were certificated with an MTGW of 75,000 pounds or less, and later increased to greater than 75,000 pounds by an amended type certificate (ATC) or supplemental type certificate (STC)

   (3) Transport Category, turbine powered airplanes with a type certificate issued after January 1, 1958

2. Are operated under 14 CFR part 121 or part 129

b. Like all AC material, this AC is not, in itself, mandatory, and does not constitute a regulation. It describes an acceptable means, but not the only means, for showing compliance with the requirements for transport category airplanes. The Federal Aviation Administration (FAA) will consider other means of showing compliance that an applicant may elect to present. While these guidelines are not mandatory, we derived them from extensive FAA and industry experience in showing compliance with the relevant regulations. On the other hand, if we become aware of circumstances that convince us that following this AC would not result in compliance with the applicable regulations, we will not be bound by the terms of this AC. We may require additional substantiation or design changes as a basis for finding compliance.

c. This material does not change, create any additional, authorize changes in, or permit deviations from, regulatory requirements.

d. Terms in this AC, such as “shall” or “must” are used only in the sense of ensuring applicability of this particular means of compliance when the acceptable means of compliance described herein is used.

(Signature block will go here)

TABLE OF CONTENTS

APPENDIX 5. WFD EVALUATION

APPENDIX 6. DETERMINATION OF ISP AND SMP

APPENDIX 7. DESIGN SERVICE GOAL

APPENDIX 8. FLEET PROVEN LIFE

CHAPTER 1. WIDESPREAD FATIGUE DAMAGE

100. GENERAL INFORMATION ABOUT THIS ADVISORY CIRCULAR.

Chapter 2 of this AC provides guidance to the TCH and the tasks the TCH must perform to comply with §25.WFD. Chapter 3 of this AC provides guidance to the operator for incorporation of a Limit of Validity into their maintenance program to comply with ¶121.WFD and 129.WFD.

101. WFD BACKGROUND

a. Metal fatigue has long been considered a significant issue to the continued airworthiness of airplanes. Fatigue cracks can grow under the repeated loads environment of the airplane eventually reducing the strength of the structure to below certification strength requirements. In recognition of this issue, the airworthiness standards for the certification of new transport category airplanes have evolved to ensure that fatigue is addressed throughout the operational life of the airplane. This has led to periodic changes in the certification standards based on the relevant knowledge base and technological advances in design, analysis, testing, manufacturing and inspection of airplanes.

b. Two forms of fatigue damage have been recognized to occur in airplanes. The first form of damage occurs in local areas of the airplane and is associated with locally high stresses and design details that do not have sufficient fatigue margins. The second form of fatigue damage is associated with general degradation of a large area of structure and is associated with similar structural details that are subjected to similar stress levels in a given structural component. This type of damage has been found in design details such as lap splices and is known as multiple site damage (MSD) or multiple element damage (MED). In some cases, MSD and MED manifests cracks that are generally too small to be reliably detected using normal inspection methods. Without intervention, MSD or MED cracks will grow and eventually compromise the structural airworthiness of the airplane. This condition is known as widespread fatigue damage (WFD).

c. The FAA, with the help of the industry has established robust programs that address long-term operational issues such as fatigue and corrosion. Even with these programs in place, it is recognized that there is a limit to the amount of data available before additional data in the form of fatigue tests and or tear down is required to extend the database. Therefore the FAA is requiring the TCH to develop a LOV of the maintenance program. Operation past the LOV would be prohibited under Parts 121 and 129 without an FAA approved addition to the maintenance program.

d. MSD and MED conditions typically occur later in the life of the airplane and may be hard to detect. Because of difficulty presented in detecting MSD and MED, the FAA has determined that maintenance based on inspection alone will not be adequate for continued airworthiness. Situations where MSD and MED occur will require the structure be replaced or refurbished at a predetermined point in the life of the airplane

e. §25.WFD, requires the TCH to assess the design details of the airplane to determine their susceptibility to WFD, establish the LOV, and any maintenance actions required to operate up to the LOV. §§121.WFD, 129.WFD, requires operators to incorporate operational limits of validity.

102-199. RESERVED

CHAPTER 2. WIDESPREAD FATIGUE DAMAGE – BASELINE STRUCTURE

200. GENERAL INFORMATION ABOUT THIS CHAPTER

This chapter provides guidance to Type Certificate Holders (TCH) on assessing airplanes for widespread fatigue damage (WFD) and establishing maintenance actions based on that assessment to prevent WFD development.

201. DEVELOPMENT OF COMPLIANCE PLANS

14 CFR 25.WFD requires the TCH to submit a compliance plan detailing how they will accomplish the necessary tasks leading to compliance with the rule. This plan must be submitted within 90 days of the effective date of the rule and must be subsequently approved by the FAA ACO. If a model fleet's high time airplane is less than Design Service Goal (DSG), the compliance plan will establish a time frame for activities to begin, if required.

202. OVERVIEW OF WFD MAINTENANCE INSTRUCTION DEVELOPMENT AND INCORPORATION.

a. Developing maintenance instructions to prevent the development of WFD in the baseline structure involves accomplishing tasks typically performed by a TCH, assisted by interested operators. There are two products that result from these tasks:

1. LOV; and,
2. Specific maintenance actions required to prevent the development of WFD.

The development of the LOV is discussed in Section 204 of this report. The development of maintenance actions required to preclude WFD up to the LOV is contained in Section 205.

The LOV would be published in an Airworthiness Limitations Section (ALS) document and is required to be adopted into an operators maintenance program by §121/129.WFD. The TCH will provide a list of maintenance actions required for safe operation beyond the DSG up to the LOV. The FAA will publish airworthiness directives for any maintenance actions required for safety. Incorporation of the WFD related information into a maintenance program will be accomplished by the operator.

b. The timing of the development of data (e.g LOV and the Maintenance actions) to prevent WFD is keyed to the high time airplane reaching the DSG when adjusted for the specific operational usage (See Appendix 7). For airplanes that have already surpassed the DSG adjusted for the specific operational usage, this information is required to be in place by compliance date of §25.WFD. For all other airplane models, this data must be provided within the timeframes discussed in Paragraph 206.

c. TCH and operators should establish Structures Task Groups (STG) for each model type and develop model specific WFD maintenance actions with oversight provided by aviation airworthiness authorities and the Aviation Rulemaking Advisory Committee's (ARAC) Airworthiness Assurance Working Group (AAWG).

203. IDENTIFICATION OF AFFECTED AIRPLANES AND CONFIGURATION. The TCH should identify all models that they hold approval authority that conform to the applicability section of this AC:

For each model identified that will require the development of an LOV beyond the DSG, the TCH should develop WFD data needed to support compliance with the WFD Rule.

The TCH should define the structural baseline configuration of the airplane to be analyzed including all model derivatives and those structural ADs that have a significant effect on the WFD characteristics of the airplane. The TCH will propose the analysis configuration to the FAA with supporting rationale.

204. Determination of Limit of Validity (LOV)

A. What is the LOV

LOV is the limit of validity of the engineering data that supports the maintenance program that has been substantiated through service experience, analysis, and/or test to preclude widespread fatigue damage.

B. Data Required to establish an LOV

The development of the LOV is a TCH task assisted by the operators. The TCH must determine if there is commercial interest in developing an LOV in discussion with their operators. If there is interest, the TCH must develop the data necessary to complement the fatigue test evidence. This shall be accomplished with the assistance of their operators and regulators, within the STG process.

The TCH should establish a candidate LOV. Nominally the means to develop the candidate LOV will be different for airplanes that have reached DSG verses those who have yet to reach it. Older airplanes may rely on Fleet Proven life to provide an initial estimate; younger airplanes may rely on an estimate based on a reduction of the fatigue reduction factor used in the analysis or test data. Discussion with operators may also be useful in determining an initial number. A candidate LOV does not necessarily establish the actual LOV. Dependant upon the airplane under consideration, the LOV may be expressed in terms of flight cycle, flight hours, or both and should take into account the anticipated future usage of the fleet, as well as the means available to the TCH to justify it.

The collection and reduction of data necessary to extend Fatigue Test Evidence includes data derived from the following sources:

- Data from Fatigue Tests
  - Full scale fatigue test with or without tear down
  - Full scale component (wing, fuselage, empennage, etc.) tests with or without tear down
  - Less than full scale component tests
- Data derived from Analysis based on Fatigue test and service experience
  - Fleet proven life techniques
  - Tear down of a high time airplane
  - Evaluation of fatigue test data and in-service problems experienced by other airplanes with similar design concepts using analysis methods which have been parametrically developed to reflect fatigue test and service experience.

Normally the data collected above is airplane level data. It is assumed that any issue that has been revealed in service has already been addressed and the data collected is representative of future predictive behavior. The data collected can be used in the applicant's methods and procedures to predict the LOV. 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 DSG or previously established 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.

The validation of the LOV for a particular fleet represents an evaluation of the data available, including technical, economic and managerial issues. It is more than examining fatigue test evidence.

Once established, the candidate LOV is validated by the seven step process outlined below:

Step 1 – Validate that the Aging Programs are in place and operational, if applicable.

Step 2 – Examine the data that establishes the amount of Fatigue Test Evidence available.

g. Full scale Fatigue Test Results – WFD findings and what was done about the findings including extension of test coverage to other models and derivatives.
h. Fleet specific in-service WFD findings and their corrective action(s). Rationalization with fatigue test results.
i. Calculation of the Fleet Proven Life. (See Appendix 8)
j. Establish an understanding of the design factors such as:
   a. Fatigue Reduction Factor

b. Expected Wing/Fuselage/Empennage/1P Stress levels
c. Analytical predicted fatigue lives

k. Cross model safety evaluations-rationalization of other fleet model MSD/MED events relative to expected in-fleet fatigue performance and what was done about it.

l. Understanding of which areas of the airplane requiring additional data and establish a plan to collect that data.

1. Additional fatigue tests; and/or,
2. Teardown and refurbishment of a percentage of in service airplanes prior to entering an extended usage; and/or,
3. Destructive teardown of one or several retired high-time airplanes.

Step 3 - Estimate the cost of additional TCH/operator actions required in collecting additional Fatigue Test Evidence

Step 4 - Make an upper limit estimate of the LOV based on the data examined. This will rely on looking on the fatigue test and analysis data collected in Tasks B and C.

Step 5 – Evaluate the maintenance actions and economics required to maintain safety out to the candidate LOV.

8. Determine the areas that are susceptible to WFD (See Appendix 4)
9. Establish the analysis configuration relative to production variants and AD mandated maintenance actions that would affect the analysis results (See Section 203 and Appendix 5)
10. Determining WFD Average Behavior (See Appendix 5)
11. For each area determine the ISP and SMP (See Appendix 6)
12. For those items that have an ISP within the candidate LOV, establish the proposed inspection if feasible.
13. For those items that have an SMP within the candidate LOV, establish the proposed rework/design change required.
14. Estimate cost of the package both to the TCH and to the operator.

Step 6 – The economics of the package must be rationalized. The candidate LOV may need to be adjusted based on the economics of additional required testing or data collection and the maintenance actions. The results are the LOV.

Step 7 – Revision of required certification documents for an operator to take advantage of the LOV including the development of maintenance actions.

E. Extension of LOV

Extension of the LOV must follow the same processes defined in the establishment of the LOV at DSG.

F. Publication of the LOV

The LOV, once established, will be published as a line item in the ALS document required under §25.1529 Appendix H. §121.WFD and 129.WFD will require the operators of these airplanes to update their maintenance program.

G. **Updating of Published Information**

Published information such as SRMs and Service bulletins must be updated to incorporate maintenance actions that include consideration for the possible development of WFD. Such updates would include new or revised maintenance inspections and or replacement times. These documents would be provided to the FAA for approval at the same time the LOV and related maintenance actions are submitted for approval.

205. Publication of Maintenance Actions required to preclude WFD

The TCH should publish maintenance actions to support the operation of the airplane up to the LOV. TCH would publish the maintenance actions using his normal procedures. The FAA would review, approve and mandate the required maintenance actions via an airworthiness directive (AD). Once the AD is issued, the operator will incorporate the requirements into his maintenance program.

206. TCH SCHEDULE REQUIREMENTS.

For those airplanes where the high-time airplane has already exceeded the DSG, the WFD related maintenance instructions (LOV plus required maintenance actions to preclude WFD) should be provided to the FAA for AD action by June 20, 2009 or one and a half years prior to the compliance date of §121.WFD or §129.WFD, whichever is later.

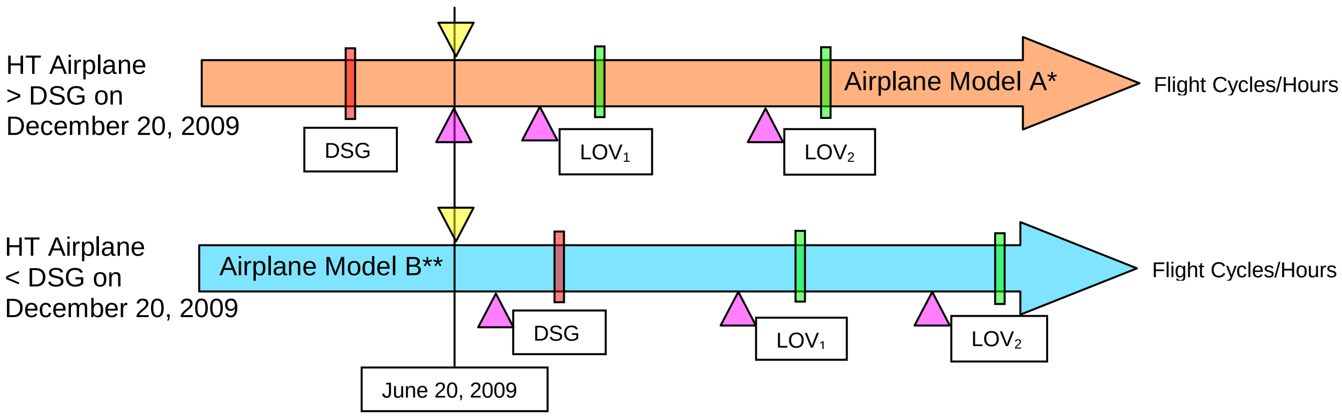
For all other airplanes, the WFD related maintenance instructions (LOV plus required maintenance actions to preclude WFD) for the baseline structure should be made available to the FAA three and half years after the effective date of §25.WFD or one and a half years prior to the estimated time the high time airplane reaches DSG, whichever is later. The FAA would approve the maintenance instructions and issue an AD to mandate the requirements. The implementation timing is illustrated in Figure 2.1

The development of WFD related maintenance data is a significant task. This activity needs to begin when the high-time airplane reaches 75% DSG or 5 years before the high-time airplane is estimated to reach the DSG. All TCH related WFD material must be submitted to the FAA for AD action one and a half years prior to when it is estimated that the high time airplane will reach DSG. The process is illustrated in Figure 2.2

207. FAA APPROVAL

The LOV and any maintenance actions to support the LOV together with the changes to published information must be presented to the cognizant FAA Aircraft Certification Office (ACO) for approval.

208. thru 299. Reserved.



*** Models include A300, B 727, DC-8 etc.**

**** Models include A330, MD-11, B 767 etc.**

▽ **Compliance Data required to Support Operator Compliance to AASR**

△ **Compliance data required for WFD one and a half years before HT airplane exceeds DSG or LOV.**

Exceptions:

(3) compliance data due June 20, 2009 if HT airplane will exceed DSG on December 20, 2009

(4) minimum period is 3.5 years after December 20, 2009 or one and a half years before DSG which ever is longer for those airplanes whose HT airplane will not exceed DSG on December 20, 2009

Figure 2.1 Timing of TCH Compliance Data Submittal to FAA

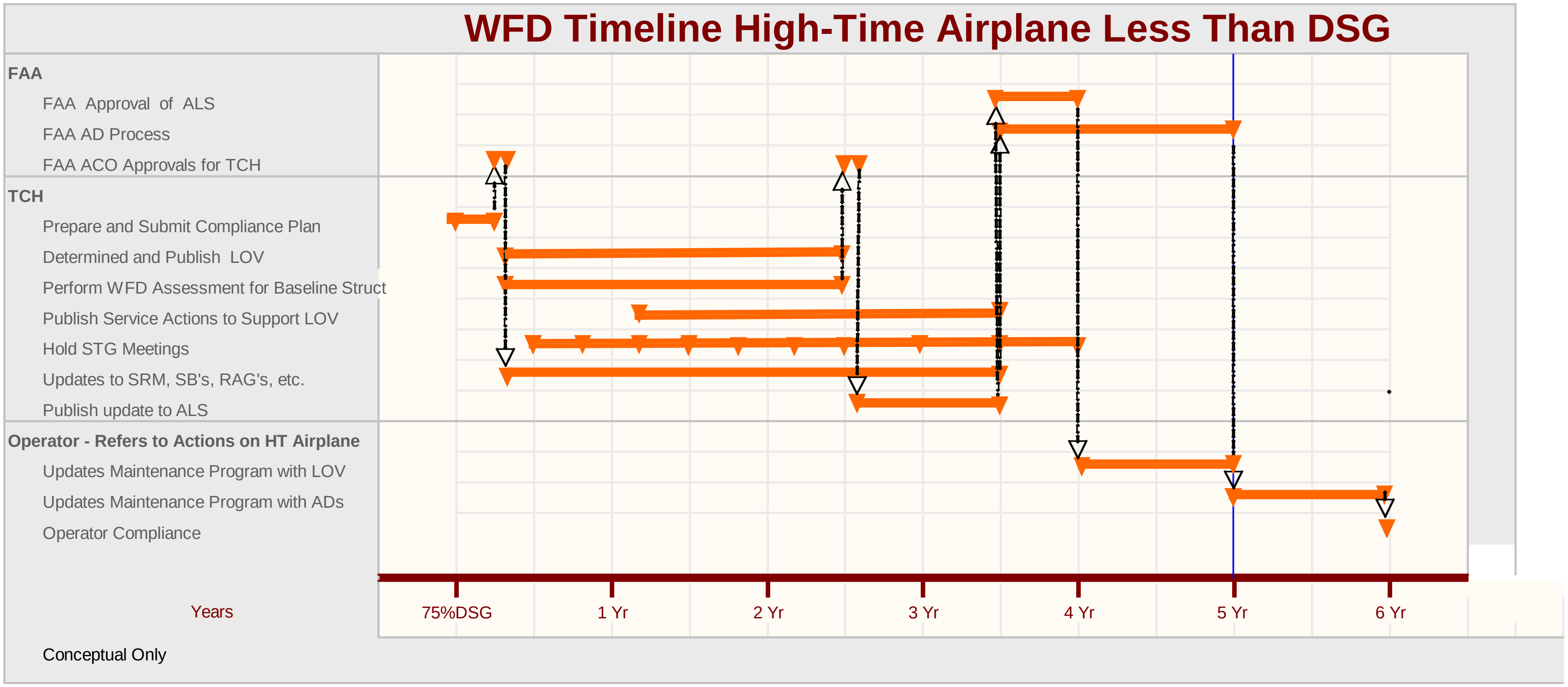


Figure 2.2 Timeline for WFD Action – High-Time Airplane Less than DSG on Rule Effective Date

CHAPTER 3. OPERATORS IMPLEMENTATION REQUIREMENTS

300. GENERAL INFORMATION ABOUT THIS CHAPTER.

This Chapter provides guidance to operators on the procedures on how to revise their maintenance programs as required by WFD rulemaking.

301. INCORPORATION OF INITIAL LOV AND MAINTENANCE ACTIONS.

For compliance to §121.WFD and §129.WFD, an operator must adopt an FAA approved ALS developed under Appendix H to part 25 into their maintenance program. This ALS must contain the LOV stated as a number of flight cycles or flight hours or both, approved under § 25.571 or § 25.1807.

Airworthiness directives will mandate maintenance actions, if any, that are required to support operation up to the initial LOV.

302. OBTAINING AND INCORPORATING SUBSEQUENT LOV AND MAINTENANCE ACTIONS.

If the operator desires to operate beyond the published LOV, then the operator should contact the TCH to investigate the possibility of a revised LOV. This contact should provide a minimum of four years in advance of the need for a revised LOV to provide sufficient time to prepare the extension package. The extension package should include the revised LOV and any maintenance actions required to support operation up to the revised LOV. This package should be developed using the procedures outline in Chapter 204 of this AC. Once approved by the cognizant FAA ACO, the operator can adopt the FAA Approved amendment to the ALS containing a revised LOV and associated maintenance actions.

303. EXISTING RESPONSIBILITIES.

a. Reporting Requirements. There are no added reporting requirements associated with the WFD rulemaking. However, the FAA encourages operators to report significant findings to the type certificate holders to ensure that prompt fleet action is taken. Existing reporting requirements under 14 CFR § 121.703 still apply.

b. Recordkeeping Requirements. There are no added recordkeeping requirements associated with the WFD rulemaking. Existing record-keeping requirements are still applicable.

c. Transfer of Airplanes after WFD rulemaking compliance date. Before adding an airplane to an air carrier's operations specifications or operator's fleet, the following should apply:

(1) For airplanes previously operated under an FAA-approved maintenance program, the new operator should ensure all applicable WFD rulemaking requirements

(LOV, maintenance actions, etc…) are incorporated into the new operator's maintenance program.

(2) For airplanes not previously operated under an FAA-approved maintenance program, the operator incorporates all applicable WFD rulemaking requirements (LOV, maintenance actions, etc…) as required.

d. Operation of Leased Foreign-Owned Airplanes. Acquisition of a leased foreign-owned airplane for use in operations under 14 CFR parts 121, or 129 will require the certificate holder to develop and implement the ALS.

304. THRU 399 RESERVED.

CHAPTER 4. ADMINISTRATIVE REQUIREMENTS

400. ADVISORY CIRCULAR AVAILABILITY

HOW DO I GET A COPY OF THE PUBLICATIONS REFERRED TO IN THIS AC?

a. The CFR and those ACs for which a fee is charged may be obtained from the Superintendent of Documents at the following address. A listing of the CFR and current prices is located in AC 00–44, “Status of Federal Aviation Regulations,” and a listing of all ACs is found in AC 00–2, “Advisory Circular Checklist.”

Superintendent of Documents
P.O. Box 371954
Pittsburgh, PA 15250–7954

b. To be placed on our mailing list for free ACs contact:

U.S. Department of Transportation
Subsequent Distribution Office
M-30
Ardmore East Business Center
3341Q 75th Avenue
Landover, MD 20785

c. You may view and print the CFR and Aircraft Certification Service and Flight Standards Service ACs on the FAA Web page at http://www.airweb.faa.gov/rgl.

401. WHO DO I SUBMIT COMMENTS TO ABOUT THIS AC?

Submit direct comments regarding this AC to:

U.S. Department of Transportation
Federal Aviation Administration
Aircraft Maintenance Division, AFS-300
800 Independence Avenue SW.
Washington, DC 20591

402. thru 499. Reserved.

APPENDIX 1. RELATED REGULATIONS AND DOCUMENTS

REGULATIONS.

The regulatory basis of this AC is 14 CFR part 21, Certification Procedures for Products and Parts; 14 CFR part 25, Airworthiness Standards: Transportation Category Airplanes; 14 CFR part 43, Maintenance, Preventive Maintenance, Rebuilding, and Alteration; 14 CFR part 119, Certification: Air Carriers and Commercial Operators; 14 CFR part 121, Operating Requirements: Domestic, Flag, and Supplemental Operations; Part 121, Subpart G, Manual Requirements; 14 CFR part 129, Foreign Air Carriers and Foreign Operators of U.S.-Registered Aircraft Engaged in Common Carriage.

24. § 21.3, Reporting of failures, malfunctions, and defects.
25. § 21.21, Issue of type certificate: normal, utility, acrobatic, commuter, and transport category aircraft; manned free balloons; special classes of aircraft; aircraft engines; propellers.
26. § 21.50, Instructions for continued airworthiness and manufacturer's maintenance manuals having airworthiness limitations sections.
27. § 21.99, Required design changes.
28. § 21.97, Classification of changes in type design.
29. § 21.101, Designation of applicable regulations.
30. § 21.113, Requirements of supplemental type certificate.
31. § 25.571, Damage-tolerance and fatigue evaluation of structure.
32. § 25.WFD, Widespread fatigue Damage
33. § 25.1529, Instructions for continued airworthiness.
34. § Appendix H to part 25, Instructions for Continued Airworthiness.
35. § 43.13, Maintenance
36. § 43.16, Airworthiness limitations.
37. § 121.153, Aircraft requirements: General.
38. § 121.363, Responsibility for airworthiness.
39. § 121.367, Maintenance, preventive maintenance, and alteration programs.
40. § 121.373, Continuing analysis and surveillance.
41. § 121.703, Mechanical reliability reports.
42. § 121.WFD, Widespread fatigue damage.
43. § 129.11, Operations specifications.
44. § 129.14, Maintenance program and minimum equipment list requirements for U.S.-registered aircraft.
45. § 129.WFD, Widespread fatigue damage.

DOCUMENTS. The following related documents are provided for information purposes and are not necessarily directly referenced in this AC.

a. Advisory Circulars. An electronic copy of the following ACs can be downloaded from the Internet at http://www.airweb.faa.gov/rgl. A paper copy may be ordered from the U.S. Department of Transportation, Subsequent Distribution Office, M-30, Ardmore East Business Center, 3341 Q 75th Avenue, Landover, MD 20785.

(1) AC 20-107A, "Composite Aircraft Structure"
(2) AC 21.101-1, "Establishing the Certification Basis of Changed Aeronautical Products"
(3) AC 25.19, "Certification Maintenance Requirements"
(4) Proposed AC 25.XX, "Subpart I, Continued Airworthiness and Safety Improvements"
(5) Proposed AC 25.571-1X, "Damage Tolerance and Fatigue Evaluation of Structure"
(6) Proposed AC 25.1529-1X, "Instructions for Continued Airworthiness of Structural Repairs on Transport Airplanes"
(7) AC 91-56A, "Continuing Structural Integrity Program for Large Transport Category Airplanes"
(8) AC 91-60, "The Continued Airworthiness of Older Airplanes"
(9) AC 120-16D, "Air Carrier Maintenance Programs"
(10) AC 120-73, "Damage Tolerance Assessment of Repairs to Pressurized Fuselages"
(11) Proposed AC 120-XX "Damage Tolerance Inspections for Repairs"
(12) AC 121-22A, "Maintenance Review Board Procedures"
(13) Draft AC 120-YY, Widespread Fatigue Damage on Metallic Structure, Published for comment May 12, 2006.

b. FAA Policy. An electronic copy of the following Policy Statement can be downloaded from the Internet at http://www.airweb.faa.gov/rgl. A paper copy may be ordered from the Federal Aviation Administration, Transport Airplane Directorate, Transport Standards Staff, Standardization Branch, ANM-113, 1601 Lind Avenue SW., Renton, WA 98055-4056.

(1) PS-ANM110-7-12-2005, Policy Statement, "Safety – A Shared Responsibility - New Direction for Addressing Airworthiness Issues for Transport Airplanes," issued July 6, 2005, effective July 12, 2005.

c. Federal Aviation Administration Final Rules. An electronic copy of the following Final Rule can be downloaded from the Internet at http://www.airweb.faa.gov/rgl.

(1) The "Fuel Tank Safety Rule Compliance Extension and Aging Airplane Program," (69 FR 45936, dated July 30, 2004).

(2) **14 CFR Parts 119, 121, 129, 135, and 183 Aging Airplane Safety; Final Rule,** (70 FR 5518, dated February 2, 2005)

d. FAA Orders.

i. Order 8110.54, “Instructions for Continued Airworthiness”

ii. Proposed Order 8300.10 Rev. XX, “Airworthiness Inspectors Handbook”

iii. Proposed Order 8110.XX, “Continued Airworthiness and Safety Improvements Responsibilities, Requirements, and Contents for Design Approval Holders”

e. Related Documents.

(1) “Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Airplane Fleet,” Revision A, dated June 29, 1999 (A report of the Airworthiness Assurance Working Group for the Aviation Rulemaking Advisory Committee Transport Aircraft and Engine Issues.)
Note: Certain terminology has changed in this AC from the above noted report. Fatigue crack initiation is now inspection start point. Point of WFD is now structural modification point.

(2) “Widespread Fatigue Damage Bridging Task Multiple Element Damage”, dated July 23, 2003 (A report of the Airworthiness Assurance Working Group for the Aviation Rulemaking Advisory Committee’s Transport Aircraft and Engine Issues Group.)
(3) Final Report of the AAWG – Continued Airworthiness of Structural Repairs*
(4) A Report of the AAWG – Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Airplane Fleet*
(5) A Report of the AAWG - Recommendations For Regulatory Action To Enhance Continued Airworthiness Of Supplemental Type Certificates*
(6) Repair Assessment Guidelines, FAA Approved Model Specific Guideline Documents**
(7) FAA Approved Model Specific Supplemental Inspection Documents**
(8) ATA Report 51-93-01 - Structural Maintenance Program Guidelines For Continuing Airworthiness***
(9) A Report to the AAWG - Structures Task Group Guidelines Document, June 1996*
(10) FAA Notice of Proposed Rule Making, Aging Aircraft Program: Widespread Fatigue Damage, Docket Number FAA-2006-24281, Published April 18, 2006.
(11) FAA Notice of Proposed Rule Making, Damage Tolerance Data for Repairs and Alterations, Docket Number FAA-2005-21693, Published April 21, 2006.
(12) Federal Register/ Vol. 67, No. 235 / Friday, December 6, 2002 / Rules and Regulations Aging Airplane Safety

(13) Aviation Rulemaking Advisory Committee; Transport Airplane and Engine Issues—New Task Federal Register / Vol. 69, No. 93 / Thursday, May 13, 2004 / Notices 26641
(14) A Report of the AAWG – Recommendations Concerning ARAC Tasking FA Doc. 04-10816 RE: Aging Airplane Safety Final Rule 14 CFR 121.370a and 129.16. Published October 28, 2005.
(15) A Report of the AAWG – Recommendations Concerning ARAC Tasking FA Doc. 04-10816 RE: Aging Airplane Safety Final Rule 14 CFR 121.370a and 129.16. Task 2 Closeout, dated 12 May 2006.

APPENDIX 2. DEFINITIONS

a. Airplane structural configuration is the approved type certificate design, including the original; any model variations or derivatives; and alterations or replacements mandated by AD.

b. Airworthiness Limitations Section (ALS) is a collection of mandatory maintenance actions required for airplane structure and fuel tank system. For structural maintenance actions, the ALS includes structural replacement times, structural inspection intervals, and related structural inspection procedures.

c. Alteration or modification is an FAA-approved design change that is made to an airplane. Within the context of this AC, the two terms are synonymous.

d. Amended Type Certificate (ATC) is a process where the type certificate holder may modify the airplane and have the modification approved by amending the original type certificate under § 21.177.

e. Damage Tolerance (DT) is the attribute of the structure that permits it to retain its required residual strength without detrimental structural deformation for a period of use after the structure has sustained specific levels of fatigue, corrosion, accidental or discrete source damage.

f. Design Approval Holder (TCH) is a person that holds a type design approval for an airplane or any FAA-approved data necessary to repair, alter, or modify airplane structure.

g. Design Service Goal (DSG) is the period of time (in flight cycles or flight hours) established at design and/or certification during which the principal structure will be reasonably free from significant cracking.

h. Federal Aviation Administration Oversight Office is the Aircraft Certification Office or office of the Transport Airplane Directorate having oversight responsibility for the relevant type certificate or supplemental type certificate, as determined by the Administrator.

i. Inspection Start Point (ISP) is the point in time when special inspections of the fleet are initiated due to a specific probability of having a MSD/MED condition.

j. Instructions for Continued Airworthiness (ICA) are maintenance actions defined by the TC or STC holder in accordance with 14 CFR 25.1529 and delivered with the airplane in accordance with § 21.509. ICAs are documented information that include the applicable methods, inspections, processes, procedures and airworthiness limitations.

k. Limit of Validity (LOV) is the limit of validity of the engineering data that supports the maintenance program that has been substantiated through service experience, analysis, and/or test to preclude widespread fatigue damage.

l. Maintenance Actions would include inspections, modifications, replacements or any combination of these.

l. Multiple Element Damage (MED) is a source of widespread fatigue damage characterized by the simultaneous presence of fatigue cracks in similar adjacent structural elements.

m. Multiple Site Damage (MSD) is a source of widespread fatigue damage characterized by the simultaneous presence of fatigue cracks in the same structural element.

n. Supplemental Type Certificate (STC) Issued for major design changes to type certificated products when the design change is not so extensive as to require a new type certificate.

o. Structural Modification Point (SMP) is the point in time when a structural area must be modified to preclude WFD.

p. Structures Task Group (STG) is a model specific group that consists of TCHs and operators responsible for the development of aging airplane model specific programs. It also includes regulatory authorities who approve and monitor those programs.

q. Teardown, is the destructive inspection of structure using visual (magnifying glass, dye penetrant etc) and/or other NDI techniques (eddy current, ultrasound etc) to characterize the extent of damage within a structure with regard to corrosion, fatigue and accidental damage.

r. Type Certificate (TC) includes the type design, operating limits, the type certificate data sheet, the applicable regulations, and any other conditions or limitations prescribed by the Administrator.

s. Type Design consists of drawings and specifications; information on dimensions, materials, and processes; airworthiness limitations; and any other data necessary to describe the design of the product (see § 21.31).

t. Type Certificate Holder (TCH) is the person who holds the type certificate.

u. 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 its residual strength requirements of §25.571(b).

APPENDIX 3. ACRONYMS

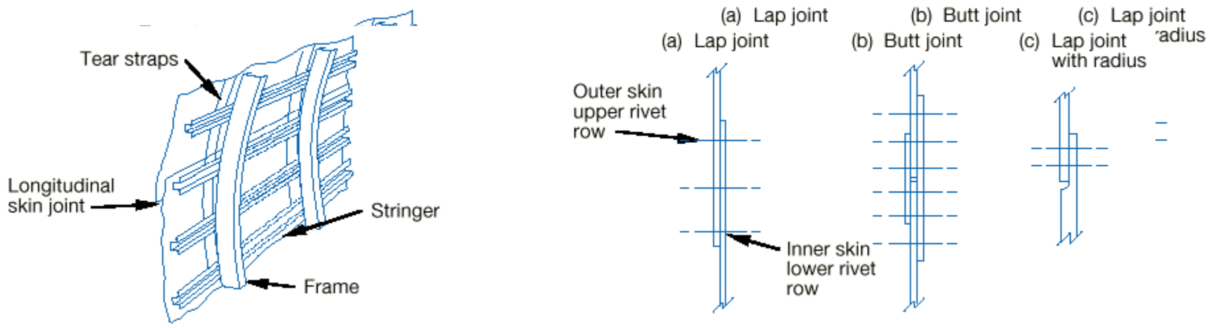
The following abbreviations are used throughout this report

AAWG	Airworthiness Assurance Working Group
AC	Advisory Circular (FAR)
AD	Airworthiness Directive
ALS	Airworthiness Limitation Section
ARAC	Aviation Rulemaking Advisory Committee
ATC	Amended Type Certificate
CAR	Civil Airworthiness Requirements
CFR	Code of Federal Regulations
DSG	Design Service Goal
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
HPF	Hours per Flight
ISP	Inspection Start Point
LOV	Limit of Validity
MED	Multiple Element Damage
MPD	Maintenance Planning Document
MSD	Multiple Site Damage
MTGW	Maximum Takeoff Gross Weight
PMI	Principal Maintenance Inspector (FAA)
SB	Service Bulletin
SMP	Structural Modification Point
SRM	Structural Repair Manual
STC	Supplemental Type Certificate
STG	Structures Task Group
RI	Repeat Inspections
TC	Type Certification
TCH	Type Certificate Holder
WFD	Widespread Fatigue Damage

APPENDIX 4. IDENTIFICATION OF STRUCTURE SUSCEPTIBLE TO WFD

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 were structural capability could be affected by interaction of multiple cracking at a number of similar details. The following list contains known types of structure susceptible to MSD/MED.

STRUCTURAL AREA	SEE FIGURE
Longitudinal Skin Joints, Frames, and Tear Straps (MSD/MED)	A4-1
Circumferential Joints and Stringers (MSD/MED)	A4-2
Lap joints with Milled, Chem-milled or Bonded Radius (MSD)	A4-3
Fuselage Frames (MED)	A4-4
Stringer to Frame Attachments (MED)	A4-5
Shear Clip End Fasteners on Shear Tied Fuselage Frames (MSD/MED)	A4-6
Aft Pressure Dome Outer Ring and Dome Web Splices (MSD/MED)	A4-7
Skin Splice at Aft Pressure Bulkhead (MSD)	A4-8
Abrupt Changes in Web or Skin Thickness — Pressurized or Unpressurized Structure (MSD/MED)	A4-9
Window Surround Structure (MSD, MED)	A4-10
Over Wing Fuselage Attachments (MED)	A4-11
Latches and Hinges of Non-plug Doors (MSD/MED)	A4-12
Skin at Runout of Large Doubler (MSD)—Fuselage, Wing or Empennage	A4-13
Wing or Empennage Chordwise Splices (MSD/MED)	A4-14
Rib to Skin Attachments (MSD/MED)	A4-15
Typical Wing and Empennage Construction (MSD/MED)	A4-16



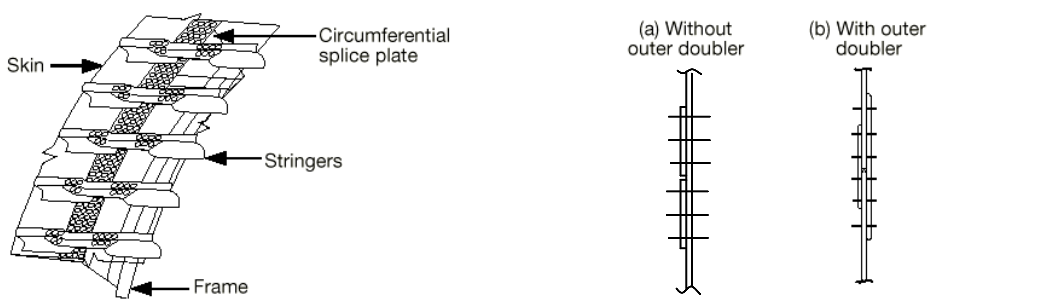
Type and possible location of MSD and MED

- MSD longitudinal skin joint
  - Lap joint
    - Outer skin upper rivet row
    - Inner skin lower rivet row
  - Butt joint
    - Skin outer rivet rows
    - Doubler inner rivet rows
  - Lap joint with radius
    - In radius
- MED—frame
  - Stress concentration areas
- MED—tear straps
  - Critical fastener rows in the skin at tear strap joint

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

Figure A4-1 ***Longitudinal Skin Joints, Frames, and Tear Straps (MSD/MED)***



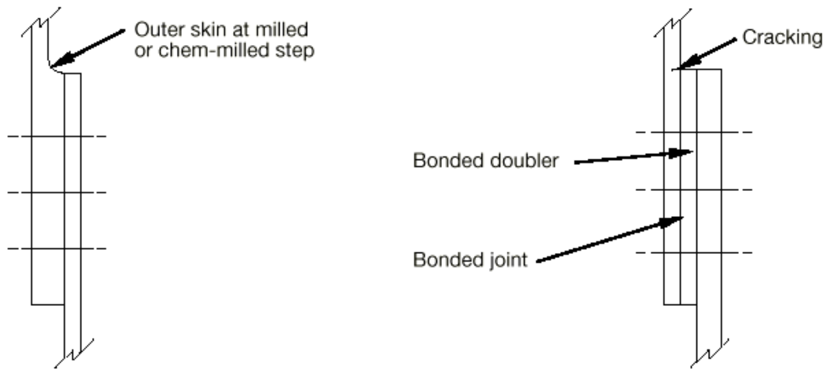
Type and possible location of MSD/MED

- MSD—circumferential joint
  - Without outer doubler
    - Splice plate—between and/or at the inner two rivet rows
    - Skin—forward and aft rivet row of splice plate
    - Skin—at first fastener of stringer coupling
  - With outer doubler
    - Skin—outer rivet rows
    - Splice plate/outer doubler—inner rivet rows
  - MED—stringer/stringer couplings
    - Stringer—at first fastener of stringer coupling
    - Stringer coupling—in splice plate area

Service or test experience of factors that influence MSD and/or MED (examples)

- High secondary bending
- High stress level in splice plate and joining stringers (misuse of data from coupon test)
- Poor design (wrong material)
- Underdesign (over-estimation of interference fit fasteners)

Figure A4-2 ***Circumferential Joints and Stringers (MSD/MED)***



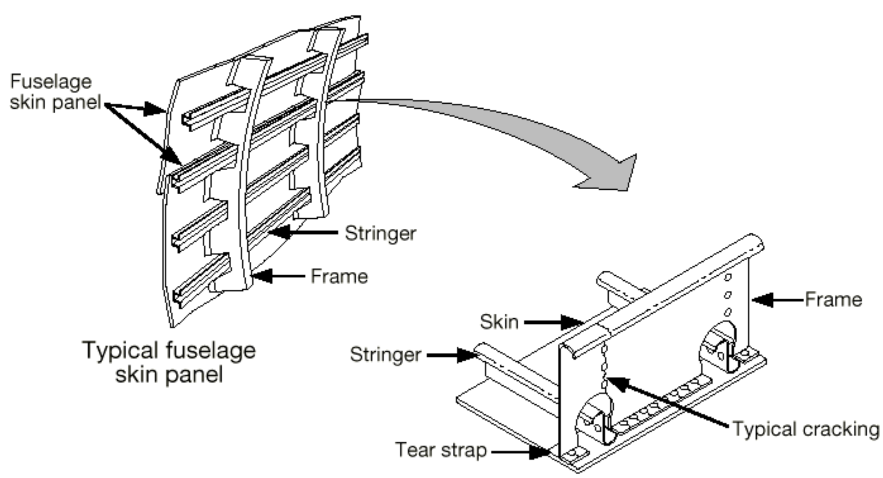
Type and possible location of MSD and MED

- MSD—abrupt cross section change
- Milled radius
- Chem-milled radius
- Bonded doubler runout

Service or test experience of factors that influence MSD and MED (examples)

- High bending stresses due to eccentricity

Figure A4-3 ***Lap joints with Milled, Chem-milled or Bonded Radius (MSD)***



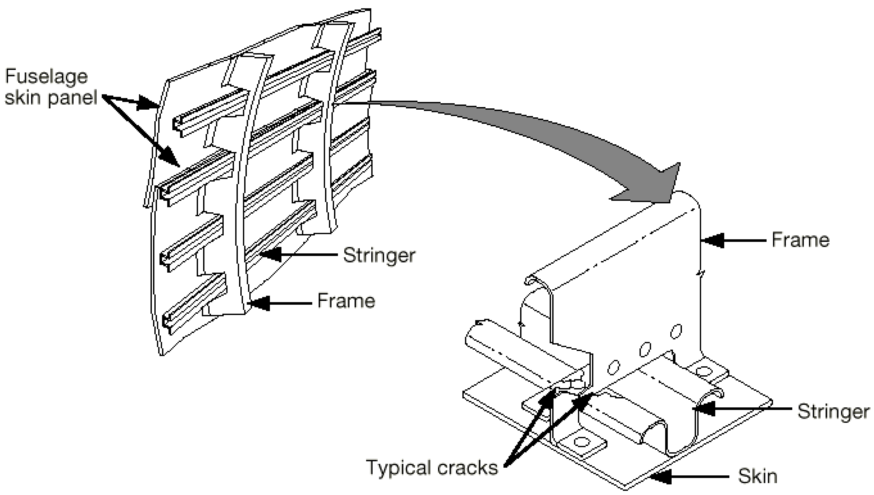
Type and possible location of MSD/MED

- 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

Figure A4-4 ***Fuselage Frames (MED)***



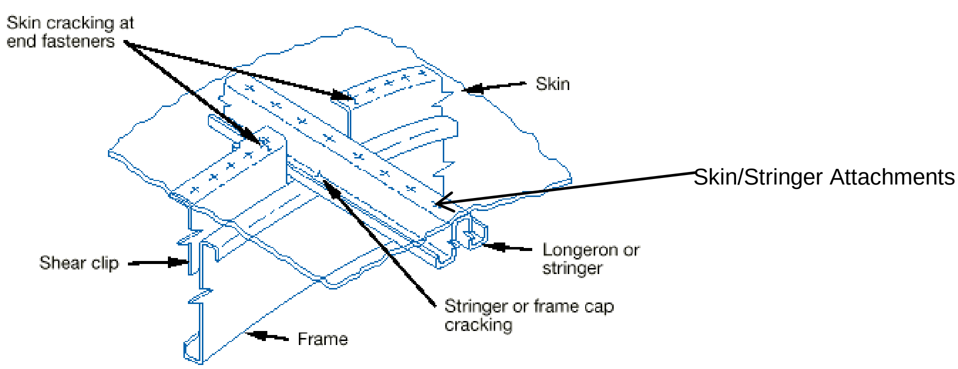
Type and possible location of MED

- MED—any combination of fracture of frames, clips, or stringers, including the attachments, resulting in the loss of the shear tie between the frame and stringer. This condition may occur at either circumferential or longitudinal locations at fuselage frame/stringer intersection.

Service or test experience of factors that influence MSD and/or MED (examples)

- Poor load path connection

Figure A4-5 ***Stringer to Frame Attachments (MED)***



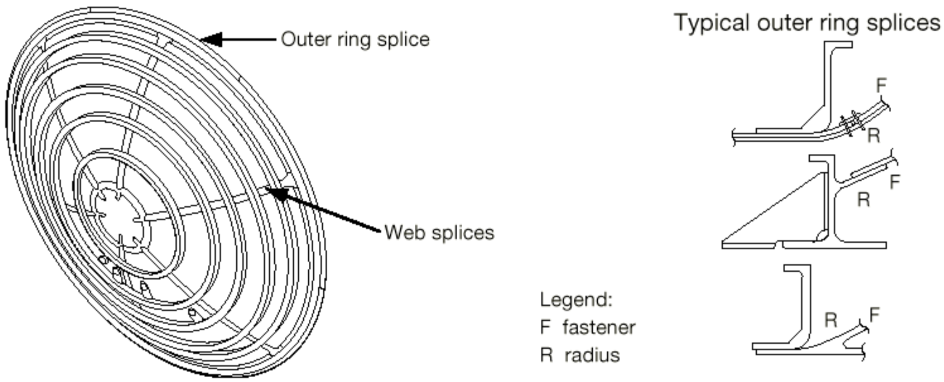
Type and possible location of MSD and MED

- 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

Figure A4-6 ***Shear Clip End Fasteners on Shear Tied Fuselage Frame (MSD/MED)***



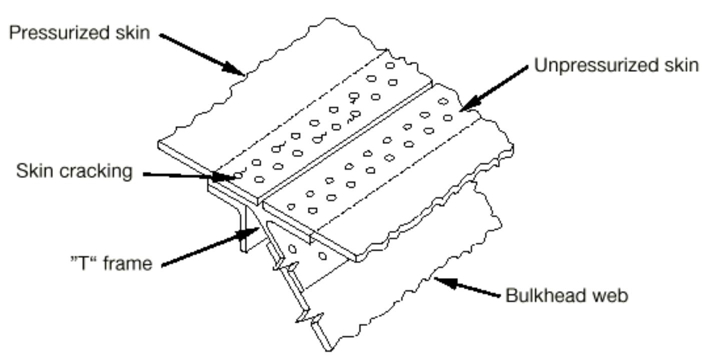
Type and possible location of MSD/MED

- 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

Figure A4-7 ***Aft Pressure Dome Outer Ring and Dome Web Splices (MSD/MED)***



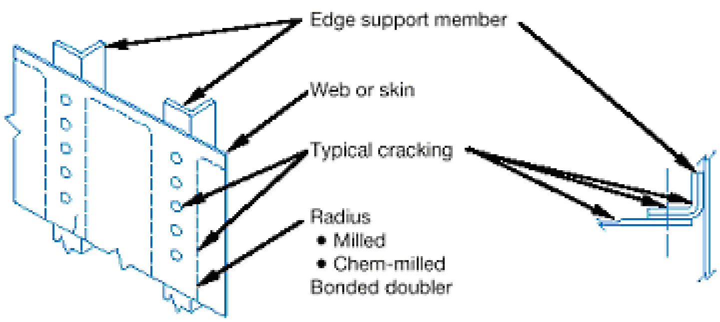
Type and possible location of MSD and MED

- MSD—skin at end fastener holes

Service or test experience of factors that influence MSD and MED (examples)

- Shell discontinuous induced bending stresses
- High load transfer at fastener

Figure A4-8 ***Skin Splice at Aft Pressure Bulkhead (MSD)***



Type and possible location of MSD and MED

Abrupt change in stiffness
- Milled radius
- Chem-milled radius
- Bonded doubler
- Fastener row at edge support members

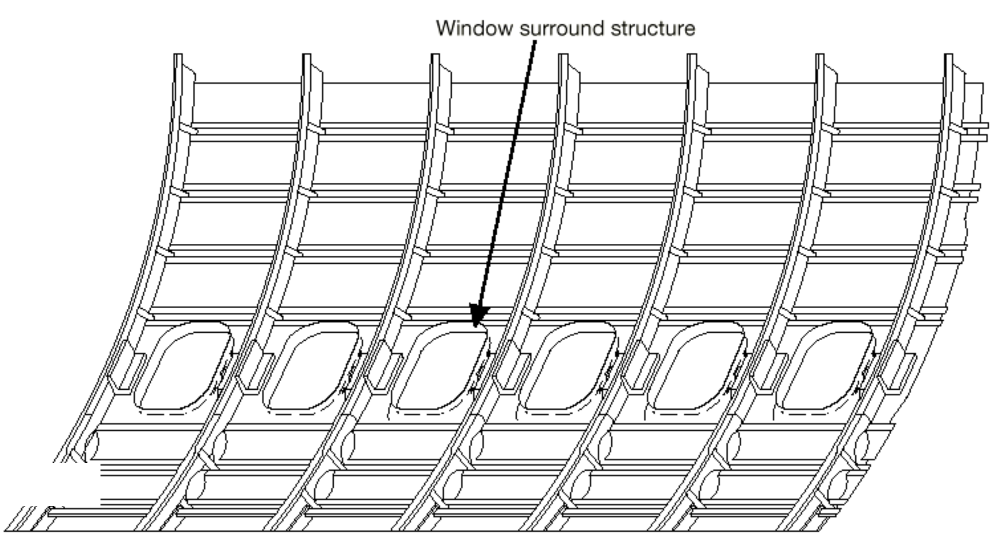
Edge member support structure
- Edge member - in radius areas

Service or test experience of factors that influence MSD and MED

Pressure structure
- High bending stresses at edge support due to pressure

Non-pressure structure
- Structural deflections cause high stresses at edge supports

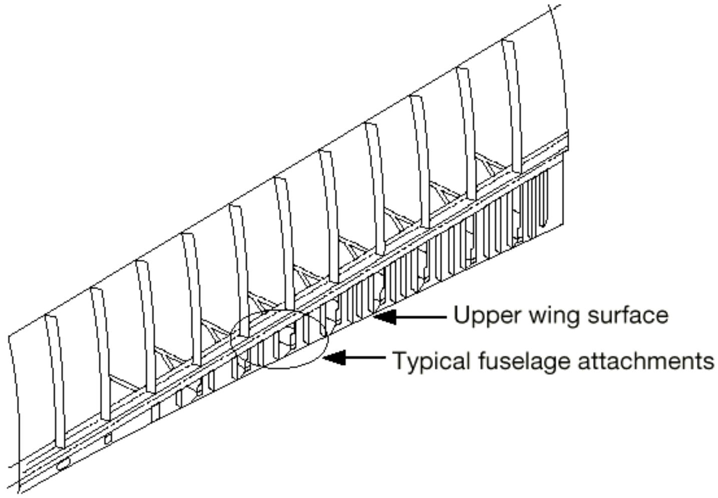
Figure A4-9 ***Abrupt Changes in Web or Skin Thickness — Pressurized or Unpressurized Structure (MSD/MED)***



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

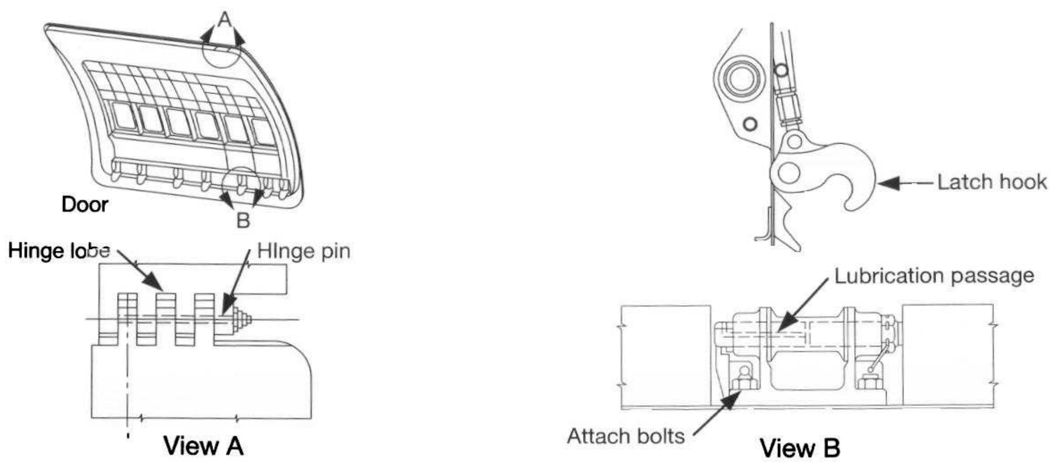
Figure A4-10 ***Window Surround Structure (MSD, MED)***



Type and possible location of MSD/MED
- MED—repeated details in overwing fuselage attachments

Service or test experience of factors that influence MSD and/or MED (examples)
- Manufacturing defect—prestress
- Induced deflections

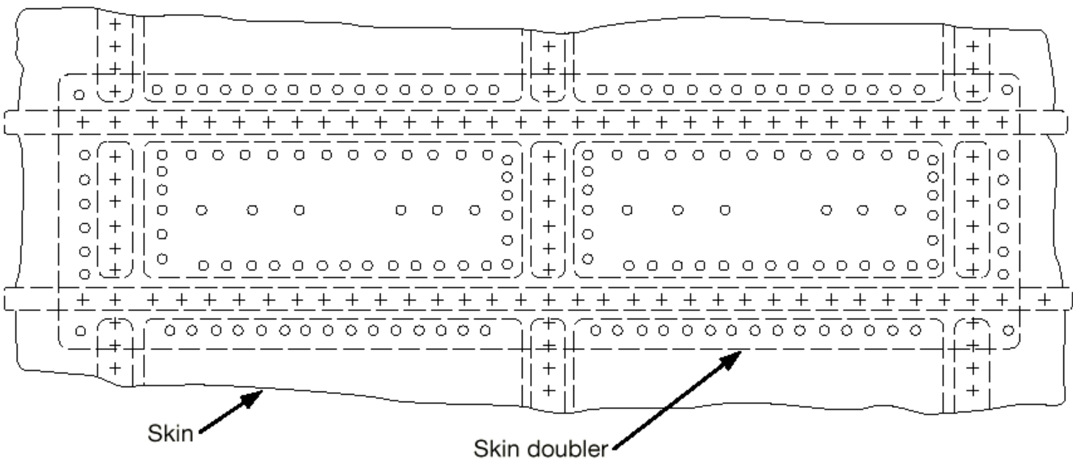
Figure A4-11 ***Over Wing Fuselage Attachments (MED)***



Type and possible location of MSD/MED
- MSD—piano hinge
  - At hinge fastener attachment row
  - In fillet radius
  - Emanating from hole in lobes
- MED—latches
  - In multiple latch hooks
  - At lube channel of latch spool
  - At spool bracket attach bolts (also corrosion)

Service or test experience of factors that influence MSD and/or MED (examples)
- Bending stresses due to fuselage elongation
- High local stress
- Fretting

Figure A4-12 ***Latches and Hinges of Non-plug Doors (MSD/MED)***



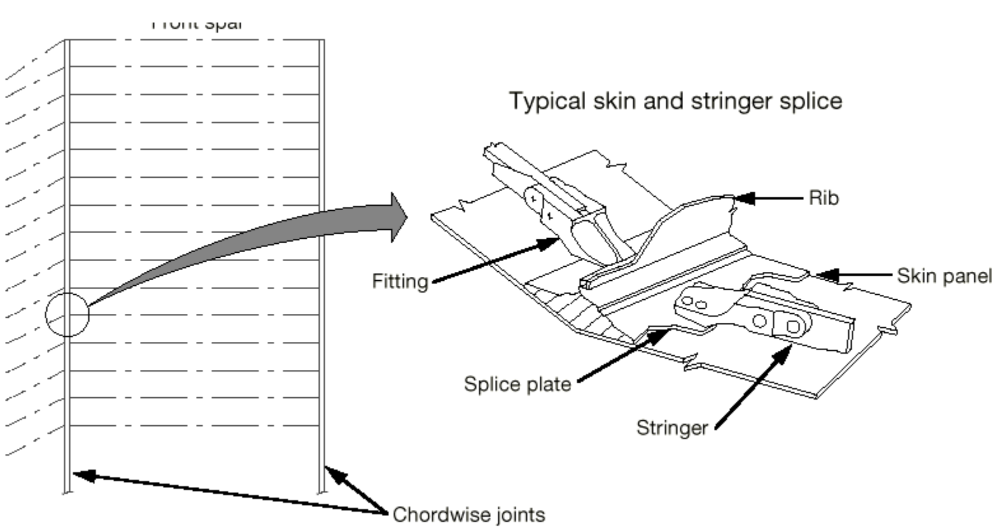
Type and possible location of MSD/MED

- 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

Figure A4-13 ***Skin at Runout of Large Doubler (MSD) — Fuselage, Wing or Empennage***



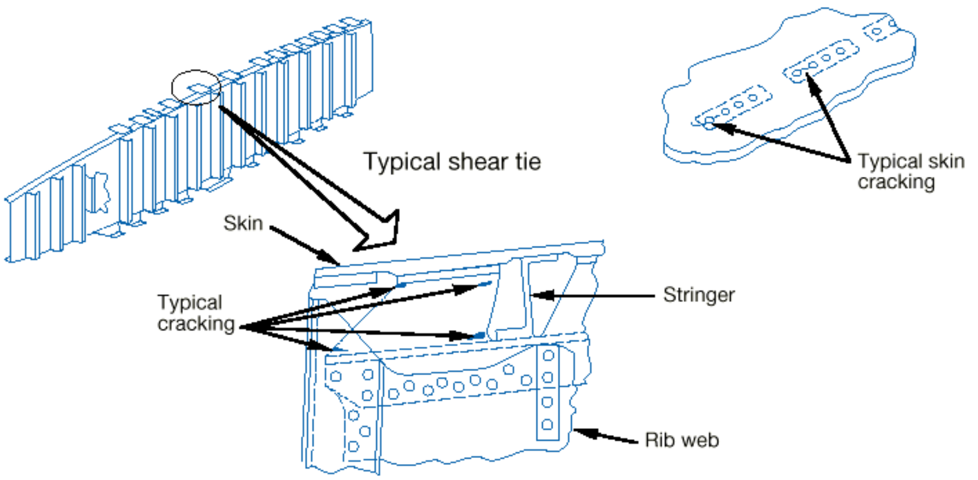
Type and possible location of MSD/MED

- 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

Figure A4-14 ***Wing or Empennage Chordwise Splices (MSD/MED)***



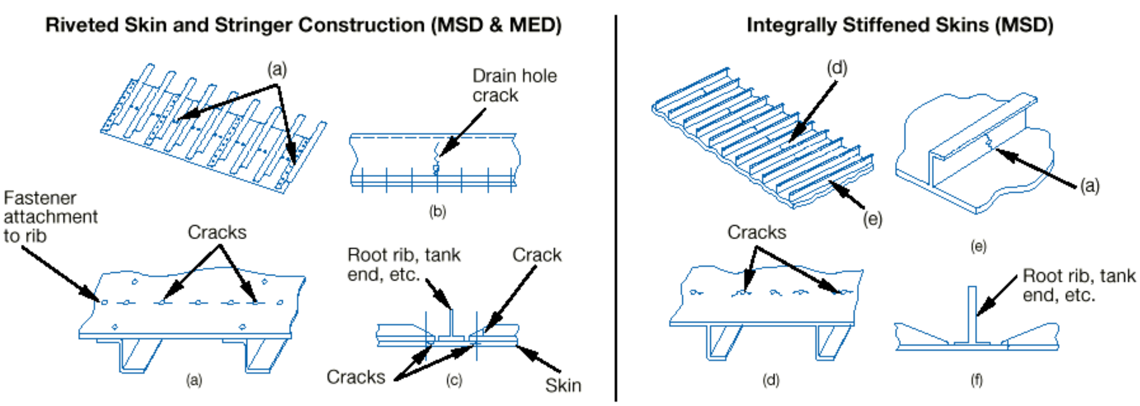
Type and possible location of MSD and MED

- MSD—critical fasteners in skin along rib attachments
- MED—critical rib feet in multiple stringer bays (particularly for empennage under sonic fatigue)

Service or test experience of factors that influence MSD and MED (examples)

- Manufacturing defect—prestress due to assembly sequence
- Sonic fatigue (empennage)

Figure A4-15 ***Rib to Skin Attachments (MSD/MED)***



Inherent fail safe and crack stopper characteristics

- MSD—chordwise cracks link up at
  - a) Rib attachment holes
- MED—
  - b) Drain or vent holes
  - c) Stiffener run-outs at root rib or tank end rib

Do not have inherent crack stopper characteristics of riveted skin and stringer construction

- MSD—Chordwise cracks link up at
  - d) Rib attachment holes
  - e) Drain or vent holes
  - f) Stringer run-outs at root rib or tank end rib
- MED—becomes MSD

Figure A4-16 ***Typical Wing and Empennage Construction (MSD/MED)***

APPENDIX 5. WFD EVALUATION

a. Characterization of Events Leading to WFD. The events that lead to WFD are shown in Figure A5-1. This figure is applicable to both MSD and MED. For any susceptible structural area, it is not a question of if WFD will occur, but when. In Figure A5-1, the "when" is defined by WFD (average behavior) which is the point when 50 percent of the airplanes in a fleet would have experienced WFD in the considered area. (Note that the probability density function for flight cycles or flight hours to WFD has been depicted for reference.) Therefore, WFD (average behavior) includes crack initiation phase and crack propagation phase with the former generally being the majority of the total life. During the crack initiation phase, there is little or no change in the basic strength capability of the structure.

The actual residual strength curve depicted in Figure A5-1 is flat and equal to the strength of the structure in its pristine state. However, at some time after the first small cracks start to grow, the residual strength begins to degrade. The crack growth continues until the capability of the structure is equal to the minimum strength required for establishing damage-tolerance-based inspections in accordance with § 25.571(b). In this context, WFD is a condition that represents a point when 50 percent of the airplanes in a fleet do not meet the minimum strength required in accordance with § 25.571(b).

b. Widespread Fatigue Damage (average behavior). The WFD (average behavior) for each susceptible structural area should be estimated. This may be done based primarily on in-service history, full-scale fatigue test evidence, analyses, or any combination of these. In making this estimate the following should be considered:

(1) a complete review of the in-service history of the susceptible areas (including loads, mission profiles, environment, and operational statistics of the fleet, stated as a number of accumulated flight cycles or flight hours);

(2) significant production variants (material, design, assembly method, and any other change that might affect the fatigue performance of the detail) including any mandated maintenance actions that would change the analysis result;

(3) relevant full-scale and component fatigue test data;

(4) teardown inspections; and

(5) any fractographic analysis available.

The evaluation of 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 (See definition in Appendix 2 of this AC). The WFD evaluation may be analytically determined, supported by test or in-service information.

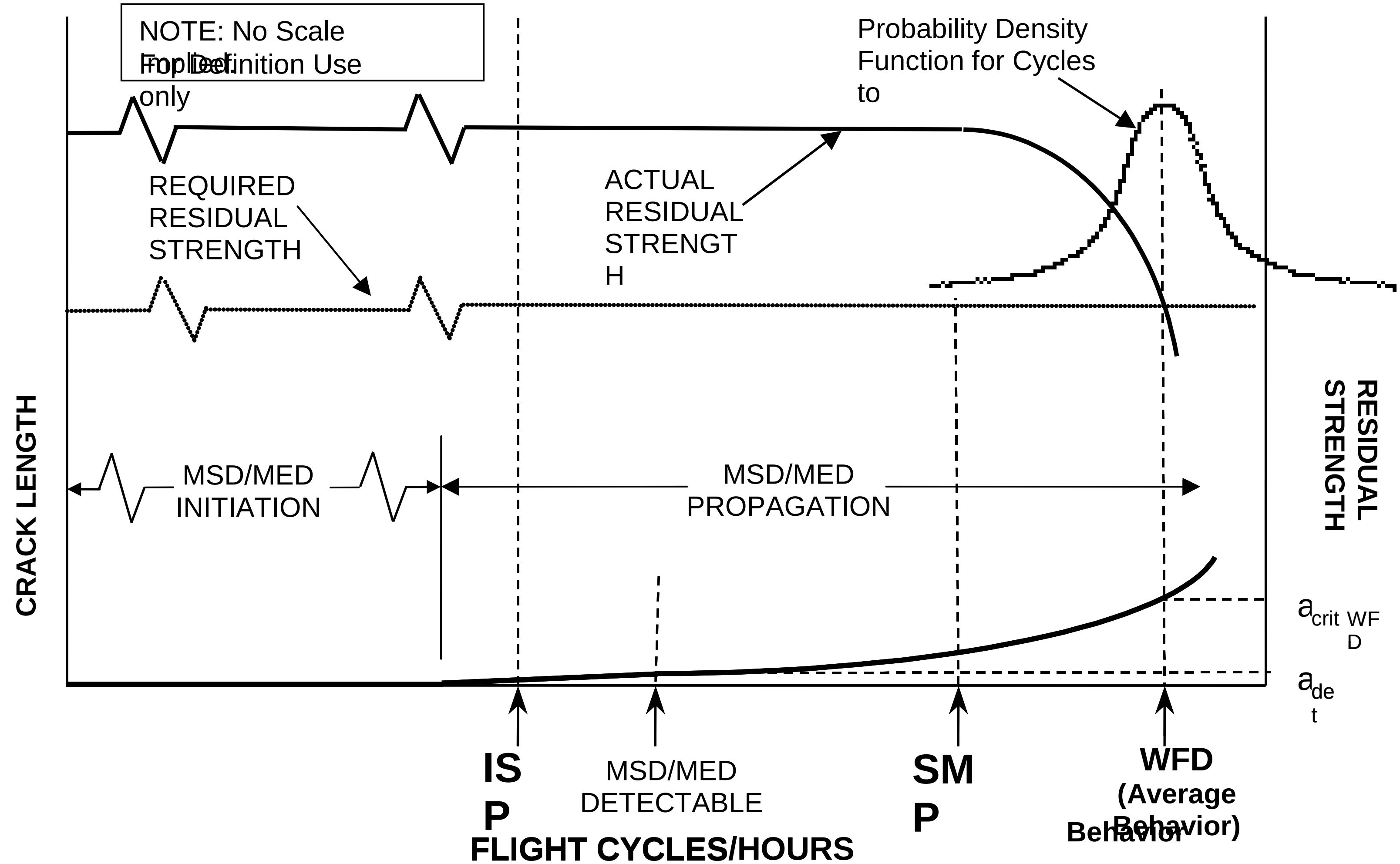


Figure A5-1
MSD/MED Residual Strength Curve

c. Cracking Pattern. Regardless of whether the assessment of WFD (average behavior) is based on in-service data, full-scale fatigue test evidence, or analyses; or a combination of any of these, the following should be considered:

(1) Initial cracking scenario. This is the size and extent of multiple location cracking expected at MSD or MED initiation. Determination requires empirical data or an assumption of the crack locations and sequence plus a fatigue evaluation to determine the time to MSD or MED initiation. Alternatively, analysis can be based on either:

(a) the distribution of equivalent initial flaws, as determined from the analytical assessment of flaws found during fatigue test or teardown inspections regressed to zero cycles, or both; or

(b) a distribution of fatigue cracking determined from relevant fatigue testing or service experience, or both.

(2) Final cracking scenario. This is an estimate of the size and extent of multiple location cracking that could cause residual strength to fall to the minimum required level (WFD condition), as shown in Figure A5-1. Techniques exist for 3-D elastic-plastic analysis of such problems; however, there are several alternative test and analysis approaches available that provide acceptable estimates. One such approach is to define the final cracking scenario as a sub-critical condition. An example of an MSD problem would be the occurrence of the first crack link-up in a row of fastener holes. An example of an MED problem would be simultaneous cracking of two or three adjacent structural elements. Use of a sub-critical scenario reduces the complexity of the analysis and, in many cases, will not greatly reduce the total time to WFD (average behavior) because the majority of the total time is generally associated with crack initiation.

(3) Crack growth. Progression of the crack distributions from the initial cracking scenario to the final cracking scenario should be developed. Crack growth predictions can be developed:

(a) *analytically*, typically based on linear elastic fracture mechanics; or

(b) *empirically*, from test or service fractographic data.

(4) Differences between MSD and MED. The details of the approach used to characterize the events that lead to WFD are expected to be different depending on whether MSD or MED is being considered. This is especially true with respect to crack interaction.

(a) Crack Interaction. With MSD, there is the potential for strong crack interaction and the effect of multiple cracks on each other needs to be addressed. With MED in most cases, there is not the potential for strong crack interaction. The differences between interaction effects for MSD and MED are illustrated in Figure A5-2.

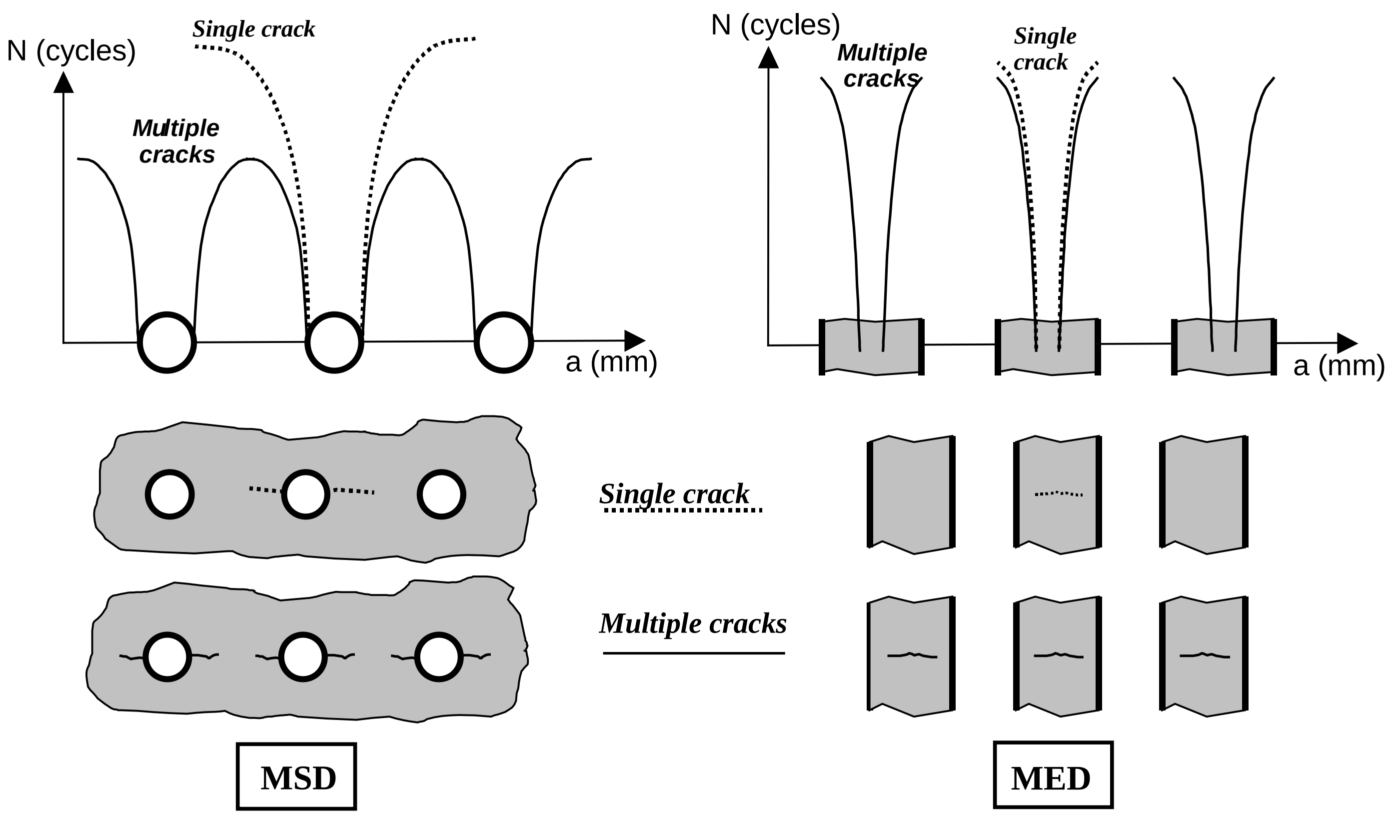


Figure A5-2
Difference Between Interaction Effects Between MSD and MED

(b) Multiple Site Damage and MED interaction. Although not considered commonplace, there is the possibility of simultaneous occurrence of MSD and MED. When this is the case, both MSD and MED should be considered and any interaction between them should be addressed. It is suggested that if an area is potentially susceptible to both MSD and MED then both problems should be worked independently. If the thresholds (ISP or SMP or initiation (nucleation)) for both MSD and MED indicate a high probability of interaction, then this scenario must be considered.

(5) Multiple Site Damage. When assessing MSD, certain assumptions or methods may have a greater impact than others on the final outcome of the WFD evaluation[1]. The following items were found to have such an impact:

(a) the flaw sizes assumed at initiation of the crack growth phase of analysis;

(b) material properties used (static, fatigue, fracture mechanics);

(c) ligament[2] failure criteria;

(d) crack growth equations used;

(e) statistics used to evaluate the fatigue behavior of the structure (e.g., time to crack initiation);

(f) methods of determining the SMP;

(g) detectable flaw size assumed;

(h) initial distribution of flaws; and

(i) factors used to determine lower bound behavior as opposed to mean behavior.

(6) Multiple Element Damage. The procedures developed and documented for MSD in the Aviation Rulemaking Advisory Committee (ARAC) Working Group report, referenced in Appendix B of this AC, are considered generally applicable to MED. However, the determination of failure modes and effects may not be as well defined in the MED case as compared to the MSD case. One of the reasons for this is that crack interaction appears to have a less significant effect on residual strength of the structure in the MED case.

[1] "Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Airplane Fleet," Revision A, dated June 29, 1999 (a report of the Airworthiness Assurance Working Group for the Aviation Rulemaking Advisory Committee's Transport Aircraft and Engine Issues Group).
[2] Ligament is the material between discontinuities in a given structure. Type of discontinuities include holes, cutouts, or cracks.

Another issue identified as unique to MED is the significance of simultaneous cracking of adjacent structural members. While the probability that subsequent to the first crack initiating in an element, the next crack to initiate will occur in an element right next to it may not be very high, the consequences to the overall structure may be severe. This is because having two structural members failed right next to each other can completely negate any ability the structure had to tolerate any additional damage.

In considering MED scenarios with more than one element failed, it should be assumed that failures are adjacent and no benefit should be taken based on the calculated probability of such an event. Specific conclusions[3] that may be reached relative to MED are summarized below:

(a) 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 assumed for conservatism as previously discussed.

(b) Typically, there is no crack interaction in MED situations; however, load redistribution should be considered when load path failure occurs.

[3] "WIDESPREAD FATIGUE DAMAGE BRIDGING TASK Multiple Element Damage," dated July 23, 2003.

APPENDIX 6. DETERMINATION OF ISP AND SMP

a. General. Fatigue damage is the gradual deterioration of a material subjected to repeated loads. This gradual deterioration is a function of use and can be statistically quantified. Widespread fatigue damage is an advanced form of fatigue where the structure is no longer able to carry the residual strength loads and is a continuation of existing deterioration that can be statistically quantified. As depicted in Figure A6-1, WFD cannot be absolutely precluded because there is always some probability, no matter how small, of it occurring. Therefore, modifying or replacing structure at a pre-determined analytically derived time, stated in flight cycles or flight hours, minimizes the probability of having WFD in the fleet. This point is referred to as the SMP and it is illustrated in Figure A6-1. The SMP is generally a fraction of the WFD (average behavior) and should result in the same reliability as a successful two-lifetime fatigue test. This level of reliability for setting the SMP is acceptable as long as MSD or MED inspections are shown to be effective in detecting cracks. The MSD or MED inspections must be implemented prior to that SMP. The implementation times for these inspections are known as ISP. Repeat inspections are usually necessary to maintain this effectiveness in detecting cracks. If MSD or MED inspections are not effective in detecting cracks, then SMP should be set at the time of ISP. For the purposes of this AC, an inspection is “effective” if, when performed by properly trained maintenance personnel, the inspection will readily detect the damage in question.[4]

As a result, the SMP should minimize the extent of cracking in the susceptible structural area in a fleet of affected airplanes. In fact, if this point is appropriately determined, a high percentage of airplanes would not have any MSD or MED by SMP.

b. Structural modification point. The SMP should be established as a point reduced from the WFD (average behavior). The establishment of the SMP should represent a specific probability of survivability and be established with the cognizant FAA ACO. As an example, the SMP may be determined by dividing the WFD (average behavior) by a factor of 2 if there are effective inspections or by a factor of 3 if inspections are not effective.

It is possible that during the structural evaluation for WFD, a TCH may find that the SMP for a particular structural area has been exceeded by one or more airplanes in the fleet. In this case, the TCH should expeditiously evaluate selected high time airplanes in the fleet to determine their structural condition. The TCH may use this data to further evaluate the required actions at SMP, which may include adjusting the SMP [See Paragraph e].

[4] The cracking identified in airworthiness directive (AD) 2002-07-09 is an example of where MSD inspections are “effective.” These cracks grow from the fastener holes in the lower row of the lower skin panel in such a way that the cracking is readily detectable using non-destructive inspection methods. The cracking identified in AD 2002-07-08 is an example of where MSD inspections are not “effective.” These cracks grow in the outer surface and between the fastener holes in the lower row of the lower skin panel in such a way that the cracking is not readily detectable using non-destructive inspection methods. Therefore, modification is the only option to address this type of cracking.

c. Inspection start point. If an inspection is determined to be effective, then this is the point at which the inspection starts. This point is illustrated in Figure A6-1 and determined through a statistical analysis of crack initiation based on fatigue testing, teardown, or in-service experience of similar structure. It is assumed that the ISP is equivalent to a lower bound value with a specific probability in the statistical distribution of cracking events. The specific probability should be established in discussion with the cognizant FAA ACO. Alternatively, the ISP may be established by applying appropriate factors (e.g., a factor of 3) to the WFD (average behavior).

d. Inspection interval. The interval should be based on the effectiveness of the inspection method because it is highly dependent on the detectable crack size and the probability of detection associated with the specific inspection method.

e. Adjustment of SMP. The initial SMP may be adjusted (extended or reduced) based on one of the following:

(1) The SMP may be extended by showing freedom from WFD up to the new SMP by performing:

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

(b) Fatigue tests of new or structure from in-service airplanes on a smaller scale than full component tests (i.e., sub-component or panel tests, or both).

(c) Teardown inspections (destructive) that could be done on structural components that have been removed from service.

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

(e) Analysis of in-service data (e.g., inspections) from a statistically significant number of airplanes.

(f) A combination of any or all of the above.

(2) If cracks are found in the structure during an inspection or during modification or replacement, the SMP should then be reevaluated to determine if the SMP provides freedom from WFD. If this is not the case, the SMP should be reduced. This reduction should be reflected in appropriate service information that describes necessary maintenance actions to address the condition of the fleet.

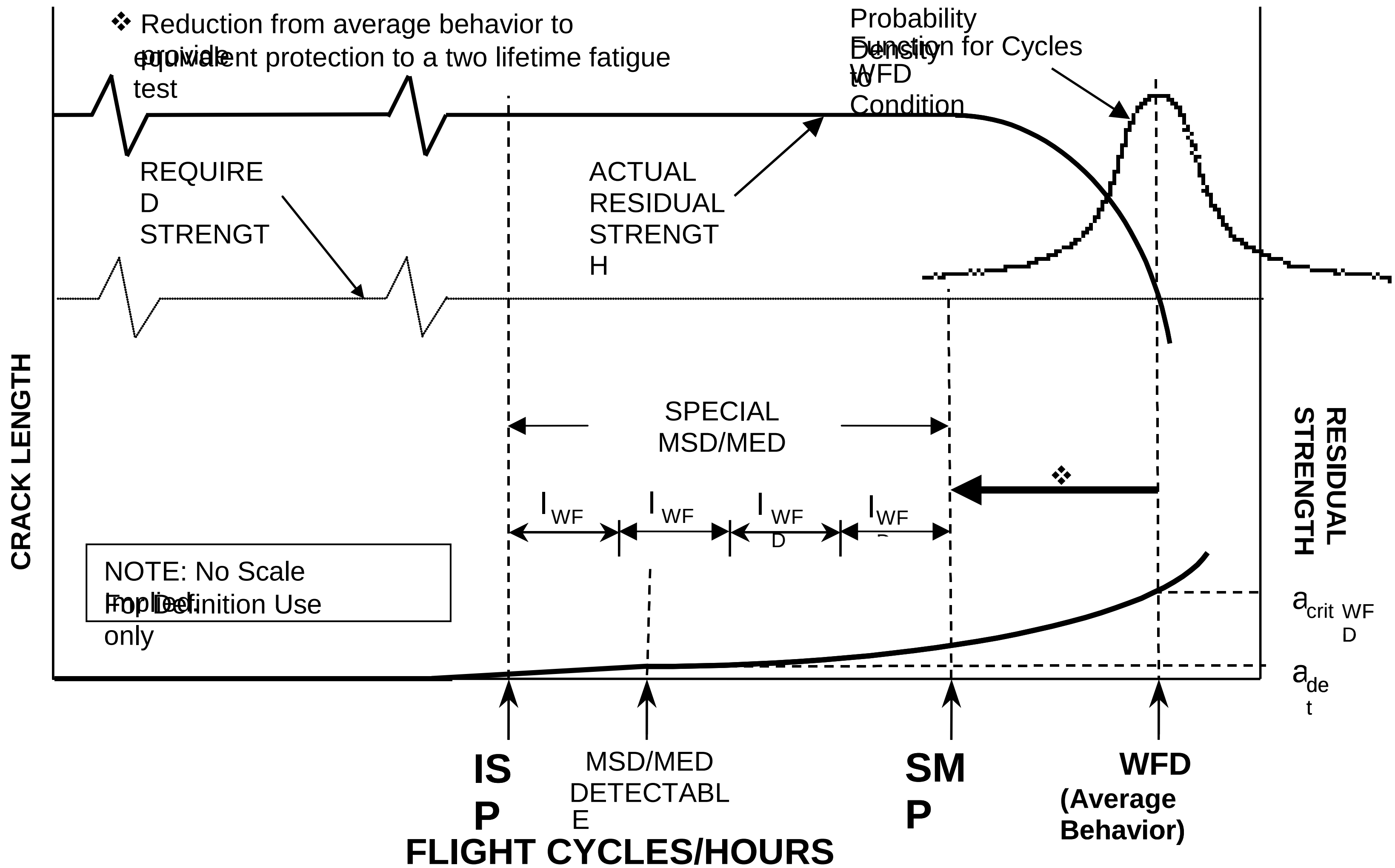

❖ Reduction from average behavior to provide equivalent protection to a two lifetime fatigue test
Probability Density Function for Cycles to WFD Condition
REQUIRED STRENGTH
ACTUAL RESIDUAL STRENGTH
CRACK LENGTH
RESIDUAL STRENGTH
SPECIAL MSD/MED
❖
I WF
I WF
I WFD
I WFD
NOTE: No Scale Implied. For Definition Use only
$a_{crit\ WFD}$
a_{det}
ISP
MSD/MED DETECTABLE
SMP
WFD
(Average Behavior)
FLIGHT CYCLES/HOURS

Figure A6-1

MSD/MED Residual Strength Curve

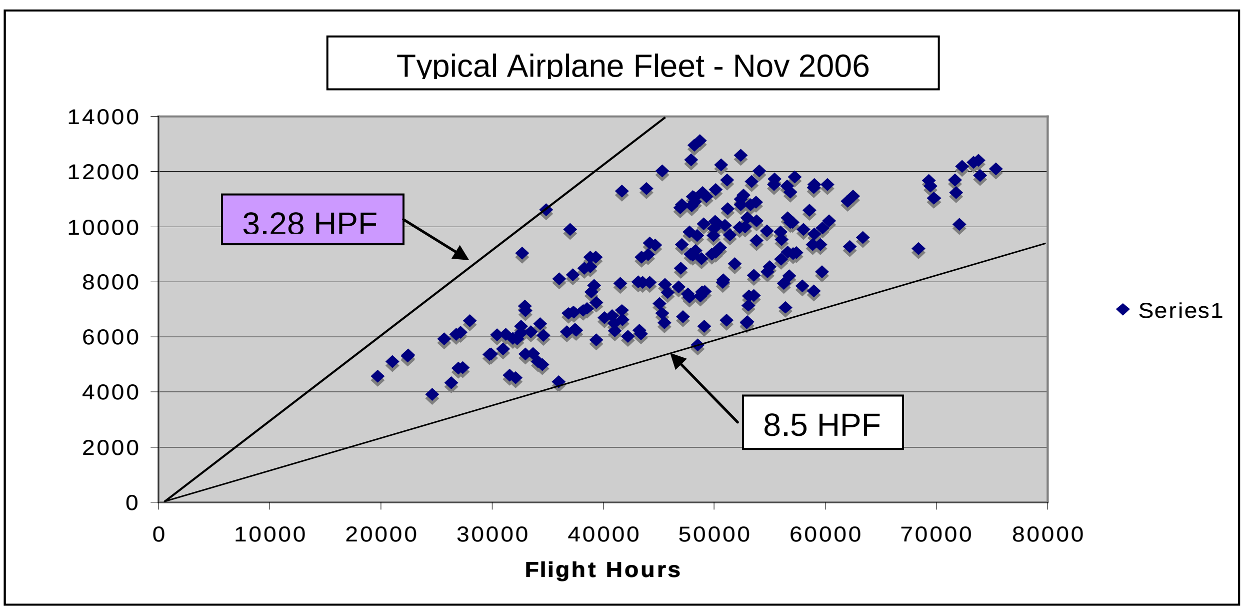
(Including WFD Inspection)

Appendix 7 – Design Service Goal

Establishment of DSG:
The DSG is associated with an airplane model specific fatigue life objective expressed in Flight Cycles. Assumptions for flight duration are taken into account in the development of the fatigue missions and loads used to design and certify the airplane. Consequently, the objective in Flight Cycles is associated to a specific flight hour objective, corresponding to the assumptions used to design and certify the airplane.

Revisiting DSG according to actual usage:
Utilization of airplanes in service will vary from Short to Long Range. The specific number of Flight Cycles and Hours expressed by the DSG may not correspond with the actual usage experienced in service. The DSG figures can be reevaluated to provide new sets of Flight Cycles and Hours that will match the service expectations. In determining these new sets of flight cycles and hours it must be insured that the fatigue damage accumulated within the adapted DSG by any structural component in the airplane will not exceed the damage cumulated within the original DSG. The published DSG is the average of several different missions used to design the airplane.

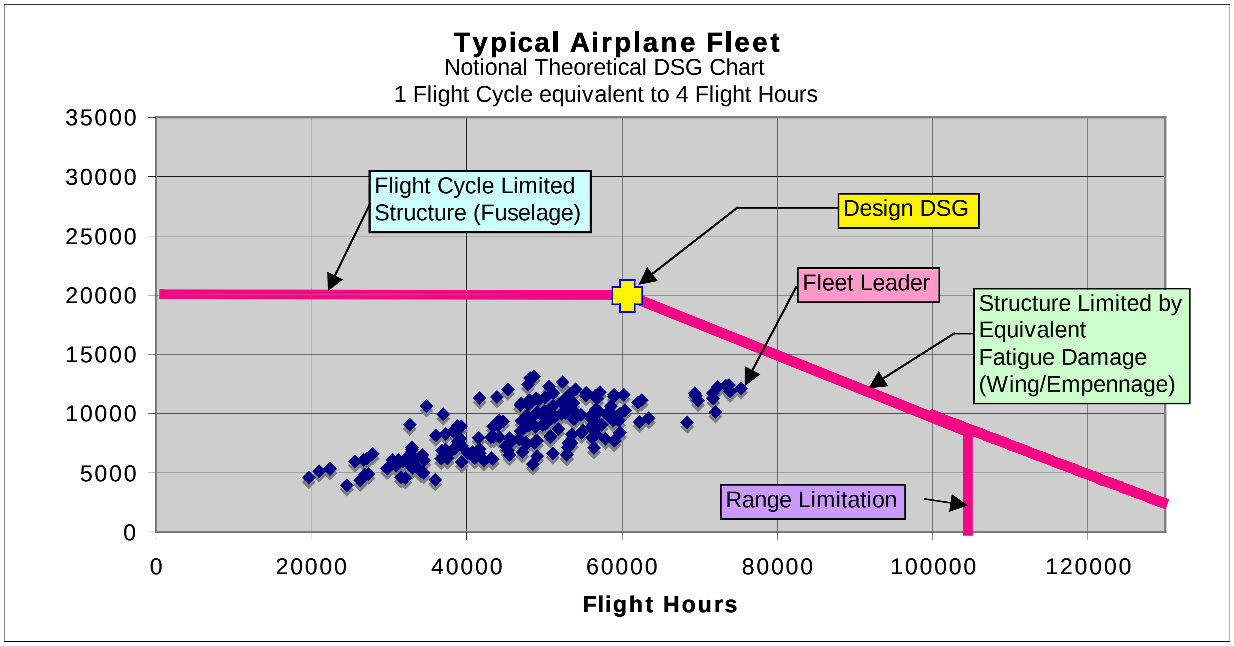
In the design of an airplane, the TCH must characterize the expected use of the airplane for the purpose of establishing fatigue test requirements for the airframe and landing gear as required under 14 CFR Part 25.571. The TCH establishes design requirements for fatigue called the Design Service Goal (DSG) with the realization that actual usage may greatly vary when airplanes enter enters service. The scatter plot below is of a typical fleet of airplanes as of November 2006. Fleet usage appears to be between 3.28 Hours per Flight (HPF) and 8.5 HPF. The airplane was designed for 20, 000 - 3 hour flights. However none of these airplanes is being used for the designed 3 HPF.



The problem is to assess what this variation in usage means in terms of fatigue damage relative to the design DSG of 20,000 – 3 hour flights.

One way would be to select one or more range critical points on the lower surface of the wing and compute the damage caused from 20,000 – 3 hour flights and then repeat the process for other different flight lengths, say 5 and 10 hours. This approach requires that flight profiles representative an average 5 and 10 hour flight be developed. When the data from the different average flights lengths becomes available, one may assess the relative damage to that of a 20,000 – 3 hour flights.

To illustrate the process, an approximation could be made concerning the number of flight hours that would be equivalent to one flight cycle. Fractrographic evidence collected from crack growth, in service of the lower wing areas suggest that the most significant damage is related to the ground-air-ground (G-A-G) cycle. While the actual relationship for a given model is dependent on a number of things, a rule of thumb is that it takes 4 flight hours to do the same amount of damage as one G-A-G cycle. Using this as a notional concept, one could plot a line of equivalent fatigue damage showing the relationship between flight cycles and flight hours. This graph is shown below for an example. The upper limit of the DSG is controlled by Flight Cycle sensitive structure Such as the fuselage), the lower end is decided based on the airplane range limitations. Thus while it might be concluded from a glance at the data that the high time airplane is above DSG (based on Flight Hours) in fact not. **The DSG of the fleet has been exceeded only when the high time airplane crosses the line of equal damage.**



Appendix 8 - Fleet Proven Life

Fleet Proven Life is a fatigue life estimate based upon the probability of a condition based on usage of and service experience for a fleet of airplanes. This approach sometimes includes the probability of a limit load occurring. An example of one such methodology is described below.

Statement of Problem

Given **n** un-failed items which are presumed to belong to a population with a fatigue life distribution of F(x, $\mathbf{X}$), but with an unknown characteristic life $\mathbf{X}$, determine to some level of confidence, a bound estimate of $\mathbf{X}$ and then a “Proven Life” according to a suitable criterion. The fleet proven life represents a 95% survivability with a 95% confidence level.

Characteristic Life Determination

Let x_i (i = 1, 2, 3,……n) be the un-failed individual airplane lives (Flights or Hours).

The probability of one or more failures in the fleet, for a given characteristic life, $\mathbf{X}$, is:

$$P_c = \prod_{i=1}^{n} \left\{1 - f\left(x_i, X\right)\right\}$$

Where:

$\left\{1 - f\left(x_i, X\right)\right\}$, represents the probability of the ith item failure.

Once a suitable P_c is established, the Characteristic Life is normally determined by iteration.

“Proven Life” Determination

The proven life calculation is generally based on the total probability of failure considering both the probability of condition and the probability of a limit load occurring. The total probability of failure is generally consider to be less than or equal to:

$$P_T = P_{cfr} * P_{LL} = 1 \times 10^{-9}$$

The probability of P_{cfr} is established as an allowable failure rate by the following equation:

$P_{cfr} = f(x)/(1-F(x))$

When f(x) is the probability density corresponding to F(x).

Design Practices:

In determining Fleet Proven Life for airplanes, the following criteria have been used:

(i) log-normal fatigue life distributions with σ = 0.14-0.20 for aluminum structure (Note: Weibul may also be used)
(ii) Pc = 0.95 – i. e. 95% confidence of survivability
(iii) Maximum allowable failure rate of 3×10^{-6} (per hour or flight) at 95% confidence.

Appendix D: Simplified WFD Methodology

Simplified WFD Methodology for the Evaluation of Repairs, Alterations and Modifications

Introduction

The proposed WFD rule would require type certificates (TC) holders to establish limits of validity (LOV) for certain affected airplane models. Additionally, the TC holders must show that the inherent fatigue and damage tolerance characteristics of the baseline structure combined with specified maintenance actions, if needed, will preclude any occurrence of WFD prior to the LOV being reached. The process used to assess the structure has been referred to as a "widespread fatigue damage evaluation" and generally includes analyses, testing, evaluation of service experience, and teardown inspections.

Recommendations on how to perform WFD evaluations were included in [Reference B.5.a] and guidance has been included in Chapter 3 of [Reference B.1.m]. Both references discuss analytical methodology that can be used to estimate the fatigue and crack growth characteristics of the structure and determine when the structure must be modified and, if practical, when inspections for fatigue cracking at multiple locations must begin. The analytical methodology presented in [Reference B.5.a] and [Reference B.1.m] is based on approaches that have been developed by TC holders and is intended to result in optimum modification and inspection requirements. However its application generally requires a comprehensive knowledge base not typically available to other than TC holders.

In accordance with existing regulations all repairs, alterations and modifications made to airplanes whose certification basis includes 14 CFR § 25.571 at amendment 96 will need to be addressed relative to WFD. If they are determined to be fatigue critical structure and susceptible to WFD then a WFD evaluation will be required. The applicant will need to show that widespread fatigue damage will not occur within the design service goal of the airplane.

If the WFD evaluation is performed by the TC holder it is expected that the methodology used will be similar to that described in [Reference B.5.a] and [Reference B.1.m]. However it is recognized that there may be repairs, alterations and modifications that are engineered by third parties that will need to be evaluated and these third parties may not have the knowledge base required to apply the methodology described in [Reference B.5.a] and [Reference B.1.m]. Because of this a simplified analysis methodology is described below that requires less of a knowledge base but could be used satisfy the intent of the requirement.

Ground Rules and Assumptions

The simplified methodology described below is intended for use by persons already possessing fatigue or damage tolerance approval authority. It is further assumed that those persons applying this methodology have the capability and/or available resources to adequately address external loads, internal loads/stresses and usage spectra/sequences required to support the methodology.

The methodology is intended to be conservative to compensate for its simplicity. It is considered an acceptable default approach if the applicant is unwilling or unable to incorporate additional elements of the more comprehensive methodology described in [Reference B.5.a] and [Reference B.1.m].

The events that lead to WFD are shown in Figure D.1. This figure is applicable to both MSD and MED. For any susceptible structural area, it is not a question of if WFD will occur, but when. In Figure D.1, the "when" is defined by $\text{WFD}_{\text{(average behavior)}}$ which is the point when 50 percent of the airplanes in a fleet would have experienced WFD in the area being considered. (Note that the probability density function for flight cycles or flight hours to WFD has been depicted for reference.) Therefore, $\text{WFD}_{\text{(average behavior)}}$ includes a crack initiation phase and a crack propagation phase with the former generally being the majority of the total life. During the crack initiation phase, there is little or no change in the basic strength capability of the structure.

The actual residual strength curve depicted in Figure D.1 is initially flat and equal to the strength of the structure in its pristine state. However, at some time after the first small cracks start to grow, the residual strength begins to degrade. The crack growth continues until the capability of the structure is equal to the minimum strength required for establishing damage-tolerance-based inspections in accordance with § 25.571(b). In this context, WFD is a condition that represents a point when 50 percent of the airplanes in a fleet do not meet the minimum strength required in accordance with § 25.571(b).

The methodology described in [Reference B.5.a] and [Reference B.1.m] determines both the crack initiation life and crack growth life to predict $\text{WFD}_{\text{(average behavior)}}$. The time at which the structure must be modified is established by applying a factor to the $\text{WFD}_{\text{(average behavior)}}$ to achieve a certain level of reliability of not having an occurrence of WFD in a fleet of airplanes. The factor applied depends on whether or not inspections for MSD/MED are also going to be mandated. Inspections for MSD/MED, if practical and if implemented, provide a second line of defense against an occurrence of WFD and therefore the factor could be less than if there are no inspections. As discussed in [Reference B.5.a] and [Reference B.1.m] a factor of 2 would typically be applied with inspections and 3 without.

The simplified methodology discussed below does not allow for inspection. This is because inspections required for reliable detection of MSD/MED must typically detect relatively small cracks and must be performed over large areas and to many details. Developing such inspections requires an NDI knowledge base and infrastructure that, in general, only TC holders possess.

The only required maintenance action that results from the simplified methodology is modification at a specified time in-service (TIS) regardless of condition. This TIS is referred to as the structural modification point (SMP). The SMP is determined by applying a factor to the estimated $WFD_{(average\ behavior)}$ to achieve a certain reliability that WFD will not occur prior to modification.

Simplified WFD Methodology

The simplified methodology includes two different approaches that may be used to estimate the $WFD_{(average\ behavior)}$. The first approach is based on fatigue crack initiation and relies on traditional SN fatigue data. The second is based on crack growth and requires application of fracture mechanics principles.

<u>Fatigue Crack Initiation Approach</u>

The $WFD_{(average\ behavior)}$, by definition, corresponds to a point in time where multiple cracks have initiated due to a normal fatigue process (i.e. no contributing anomalies) and have propagated to the point that the residual strength has degraded to the level required by 25.571(b).

Since the crack initiation phase represents a significant percentage of the $WFD_{(average\ behavior)}$ a crack initiation analysis could be used to conservatively estimate it. In order to do this the analyst would need to know the stress applied to the detail under consideration, the fatigue life versus stress relation for the detail (e.g. SN curve), the PDF for the fatigue life of the detail and the number of details in the component (e.g. repair) being assessed.

The determination of the SMP is illustrated in Figure D.2 for a repair subject to a constant alternating stress, Sa, (e.g. fuselage skin doubler where the skin stress is due to internal pressure only). The repair has n occurrences of the same critical detail (e.g. outer fastener holes). The PDF of the fatigue life for the detail is shown and p1 is the probability of crack initiation at N1. The PDF for the fatigue life of the repair is also shown. P_n is the probability of initiating a crack at one detail at N1 and it is given by,

$$P_n = 1 - (1 - p_1)^n$$

Calculation of the SMP for this repair would proceed as follows,

a) Enter the average fatigue life curve at the applied stress level, S_a, to determine the average fatigue life of a single detail, N_D. (Note: If the applied stress is not uniform across all details being considered use the maximum.)
b) For P_n = .5 solve for p_1 using the relation given above.
c) Using p_1 and the PDF for the detail determine N_1. This is also the average life for the repair to initiate a crack in one detail which will be used as an estimate of the $WFD_{(average\ behavior)}$
d) Divide N_1 by a factor of 3 to determine the SMP.

WORKED EXAMPLE:

Consider a fuselage repair doubler that spans 5 frame bays as illustrated below.

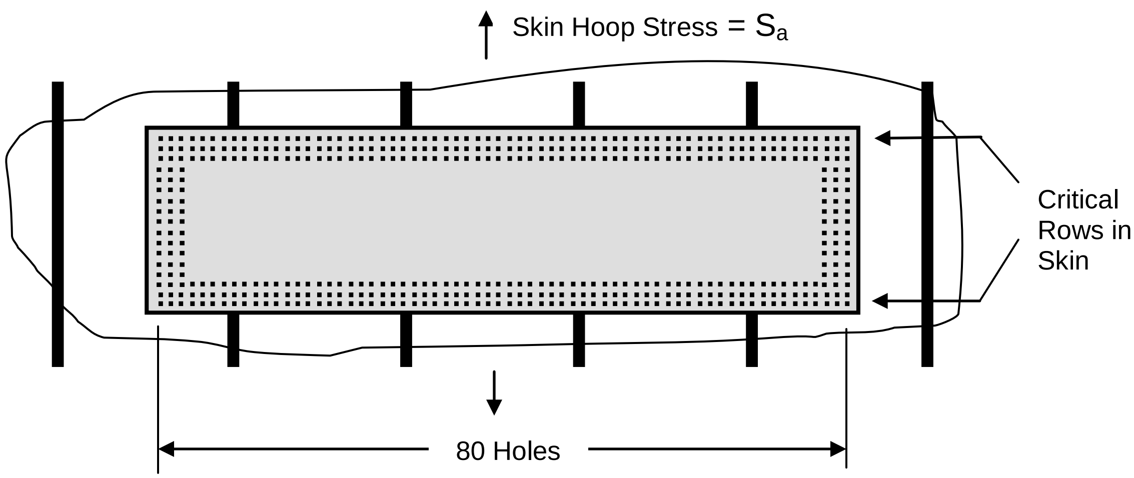


Figure D.2 – Repair Example

For this example it is assumed that the critical fuselage longitudinal skin crack size is less than 2 frame bays in length. Additionally the detail most like to develop normal fatigue cracks first are the holes in the skin that are coincident with the outer longitudinal row of holes in the doubler. Multiple site cracking in these holes could eventually result in a skin crack larger than the critical size without detection during normal maintenance. It would require special directed inspections for relatively small cracks at 160 holes to adequately manage normal fatigue wear out. This is considered impractical and unreliable. Therefore it will be necessary to eventually modify this repair before there is a significant probability of any crack initiation at these holes. An SMP is calculated as follows:

Given –

- The mean SN curve for a single outer skin hole (i.e. one detail) subjected to a alternating far field skin stress of S_a gives a mean fatigue life of 100,000 cycles.
- The fatigue life for a single hole is log normally distributed with a standard deviation, σ = .15.

Solve for p1,

$$P_n = .5 = 1 - (1 - p_1)^{80}$$
$$1 - p_1 = (.5)^{1/80}$$
$$p1 = .008627$$

The life associated with this probability, $N_{.008627}$ is given by,

$\text{Log } N_{.008627} = \text{Log } 100000 - z\sigma$

Where z is the normal standard variate corresponding to an area under the normal distribution curve of 1-.008627-.5 = .4914. z is given in the standard normal distribution table as 2.382.

Solving for $N_{.008627}$,

$$z\sigma = \text{Log } 100000 - \text{Log } N_{.008627}$$

$$z\sigma = \text{Log}(100000/N_{.008627})$$

$$10\text{^}(z\sigma) = 100000/N_{.008627}$$

$$10\text{^}(2.382\text{x}.15) = 2.27667$$

$$N_{.008627} = 100000/2.27667 = 44000 \text{ cycles}$$

The SMP is,

$$\text{SMP} = 44000/3 = 14667 \text{ cycles}$$

(1) Draft Advisory Circular 120-YY, “Widespread Fatigue Damage”.

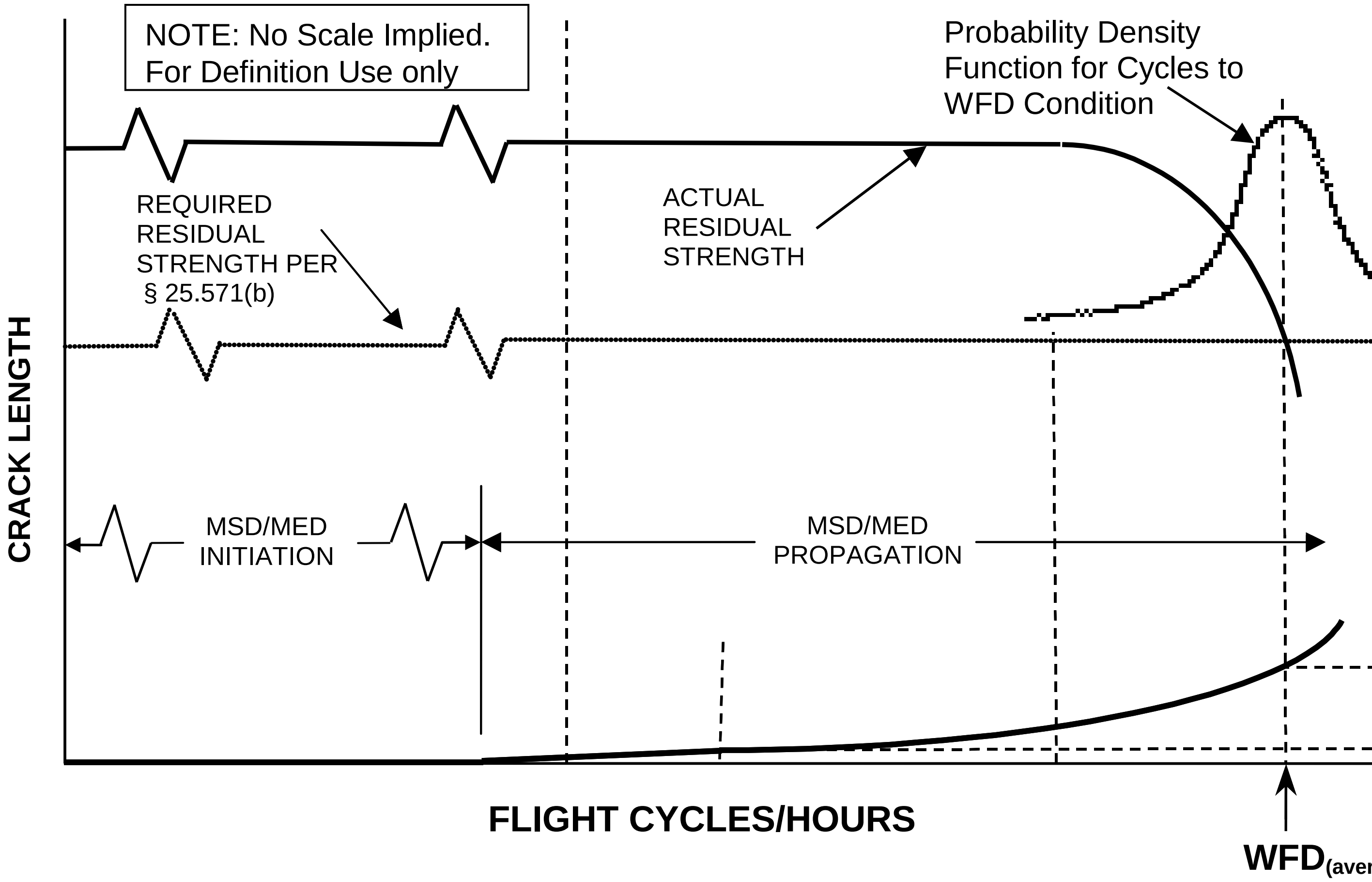


FIGURE D.1 EVENTS LEADING TO WFD

Appendix E: Screening of Repairs

Comments on the screening process to be used to come up with a short list of structure that needs a WFD Assessment

The screening process will consist of a model specific screening criteria developed by TCH/STG. The operator, in the process of surveying the airplane for compliance to the AASR, would apply the criteria to each repair found to arrive at a list of repairs and alterations that will require further evaluation as part of the WFD assessment. It is conceivable that some repairs and alterations that are listed will not require a WFD based maintenance program as a result of the assessment.

The goal in establishing the screening criteria will be to develop criteria that are simple and easily implemented without ambiguity. The operator will most likely be given certain repair attributes such as repair/alteration physical size, location and proximity to other repairs to record during the survey. Later, the operator will use the recorded data to note which repairs will require a WFD assessment based on the model specific data provided by the TCH/STG. The screening criteria provided by the TCH/STG should be based, in part, on whether or not a damage tolerance based inspection[1], by itself, can be relied upon to preclude a catastrophic failure due to fatigue should a WFD condition develop. All repairs identified by the screening process will require a WFD assessment and development of an SMP. If an inspection program is determined to be feasible, an ISP and inspection requirements should also be developed and rationalized with the required damage tolerance inspections to arrive appropriate inspections to preclude catastrophic failure. If an inspection program is not feasible, the SMP must be set at the ISP. It is conceivable that the SMP may be much greater that LOV and for all practical purposes might have no impact on operation.

Even though the screening criteria developed is in terms of physical attributes that are easily determined it must be made clear that the criteria were arrived at based on the reliability of damage tolerance based inspections continued airworthiness. If the initial focus is put on physical attributes like the number of details involved, type of stress gradient, size of repair, etc. one could easily loose track of the fundamental issue which is inspection reliability.

1. A damage tolerance based inspection is one that is based on predicted (e.g. analysis supported by test) crack growth and residual strength. The cracking scenario considered could be single cracks or multiple cracks in multiple or singular elements.

Appendix F: Design Service Goal

1. Establishment of DSG:

The DSG is associated with an airplane model specific fatigue life objective expressed in Flight Cycles. Assumptions for flight duration are taken into account in the development of the fatigue missions and loads used to design and certify the airplane. Consequently, the objective in Flight Cycles is associated to a specific flight hour objective, corresponding to the assumptions used to design and certify the airplane.

2. Revisiting DSG according to actual usage:

Utilization of airplanes in service will vary from Short to Long Range. The specific number of Flight Cycles and Hours expressed by the DSG may not correspond with the actual usage experienced in service. The DSG figures can be reevaluated to provide new sets of Flight Cycles and Hours that will match the service expectations. In determining these new sets of flight cycles and hours it must be insured that the fatigue damage accumulated within the adapted DSG by any structural component in the airplane will not exceed the damage cumulated within the original DSG.

In the design of an airplane, the TCH must characterize the expected use of the airplane for the purpose of establishing fatigue test requirements for the airframe and landing gear as required under 14 CFR Part 25.571. The TCH establishes design requirements for fatigue called the Design Service Goal (DSG) with the realization that actual usage may greatly vary when the airplane enters service. The scatter plot below is of a typical fleet of airplanes as of November 2006. Fleet usage appears to be between 3.28 Hours per Flight (HPF) and 8.5 HPF. The airplane was designed for 20, 000 - 3 hour flights. However none of these airplanes is being used for the designed 3 HPF.

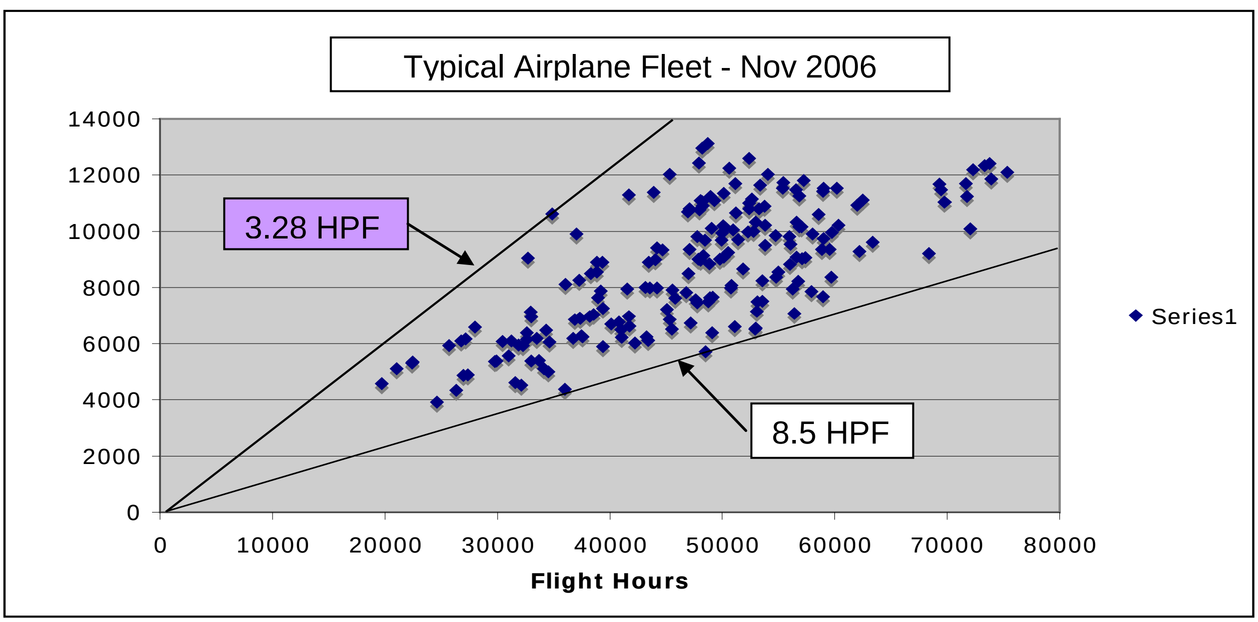


FIGURE F.1 SCATTER PLOT OF TYPICAL AIRPLANE FLEET, NOVEMBER 2006

The problem is to assess what this variation in usage means in terms of fatigue damage relative to the design DSG of 20,000 – 3 hour flights.

One way would be to select one or more range critical points on the lower surface of the wing and compute the damage caused from 20,000 – 3 hour flights and then repeat the process for other different flight lengths, say 2 and 10 hours. This approach requires that flight profiles representative of a 2 and 10 hour flight be developed. When the data from the different flights lengths becomes available, one may assess the relative damage to that of a 20,000 – 3 hour flights.

To illustrate the process, an approximation could be made concerning the number of flight hours that would be equivalent to one flight cycle. Fractrographic evidence collected from crack growth, in service of the lower wing areas suggest that the most significant damage is related to the ground-air-ground (G-A-G) cycle. While the actual relationship for a given model is dependent on a number of things, a rule of thumb is that it takes 4 flight hours to do the same amount of damage as one G-A-G cycle. Using this as a notional concept, one could plot a line of equivalent fatigue damage showing the relationship between flight cycles and flight hours. This graph is shown below for an example. The upper limit of the DSG is controlled by Flight Cycle sensitive structure (such as the fuselage), the lower end is decided based on the airplane range limitations. Thus while it might be concluded from a glance at the data that the high time airplane is above DSG (based on Flight Hours) in fact not. **The DSG of the fleet has been exceeded only when the high time airplane crosses the line of equal damage.**

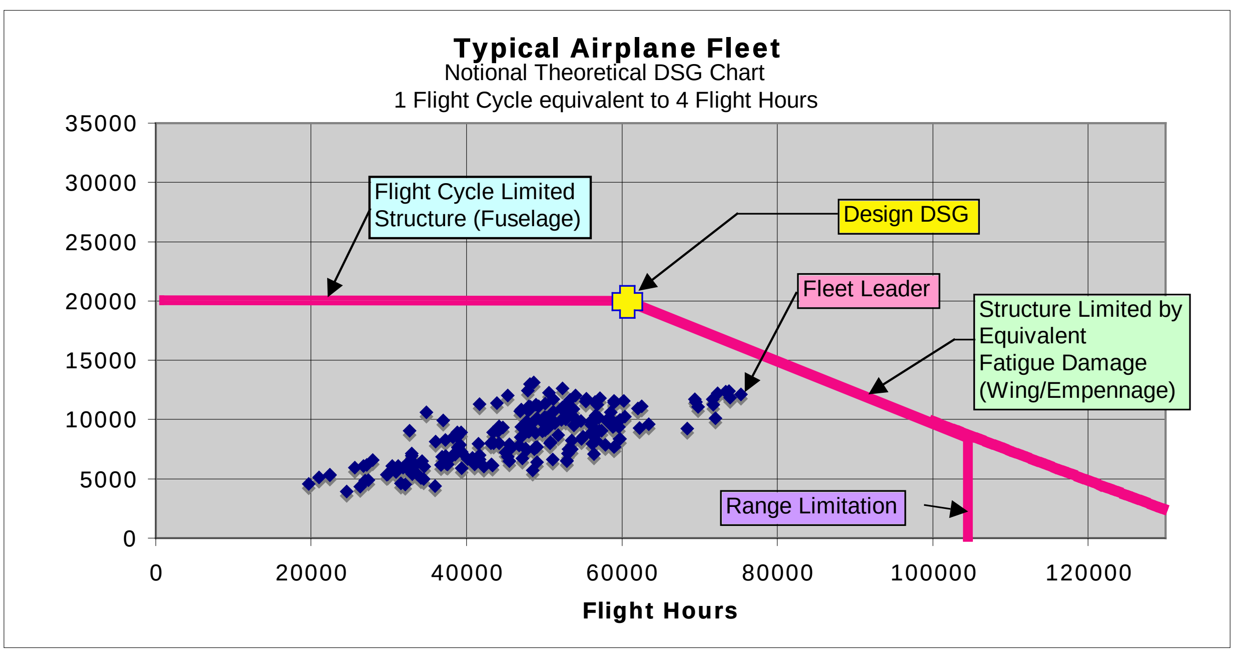


FIGURE F.2 – DSG CHART OF A TYPICAL AIRPLANE

Appendix G: Existing STC Modifications

The following pages represent the STCs reviewed to determine the total number of STCs that might require an assessment for WFD. Eleven US and Foreign operators were surveyed and 642 STC were considered.

Table G.1 STCs Considered

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
ST10147SC-D	Installation of Dual Medium Data Rate Satelite System	DC9-82/83	10	Antenna and Racks / 25.571 - 25-10 (40 on rest)	0
ST9680SC-D	Install Main Deck Crew Rest	777-200	82	Decompression Anal.; Frame Attachment	0
SA3981SW-D	Global Positioning System - Eval.	DC9-82/83	10	Antenna	0
SA3968SW-D	Inboard Refueling - Improved Fuel Mixing	DC9-82/83	10	Wing Rib Cut-outs for Piping Changes	1
SA3961SW-D	Installation of Partial TCAS Provisions	DC10-10	22	Doubler covered per DAC design (SB 34-125)	0
SA3960SW-D	Installation of Partial TCAS Provisions	767 Series	45	Boeing DER Approved Doubler Instl.	0
SA3953SW-D	MOD S Transponder Installation	DC9-82	10	Antenna Cut-out	0
SA3954SW-D	TCAS Provisions	DC9-82	10	Antenna	0
SA3955SW-D	MOD S Transponder Installation - Not Used	727-200	CAR 4b	Antenna; 1.0" cut-out; Equiv. to Boeing Instl.	0
SA3956SW-D	TCAS Installation	727-200	CAR 4b	Antenna Cut-out	0
SA3920SW-D	Install Airfone - Sold to Airfone 12/2/86	767-200/-300	45	Antenna - Under 1.0" dia. Hole (Sold to Airfone)	0
SA3915SW-D	Install Galley and Overhead Bins	727-200	CAR 4b	Significant Change to Celing Attachment	0
SA2628SW-D	Install Mid Cabin Lavatories (Fuselage Dblr)	DC10-10	22	External Reinforcement Doubler	1
ST830SE	Installation of Winglets/Wing Changes	737-800	77/91	Not Purchased/Reviewed Only	0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
In-Work	Installation of Winglets/Wing Changes	757-200	45	Not Avail. Yet - In Development	0
ST225NY	AT&T Passenger Phone	DC10 Series	22	Antenna	0
ST270NY	Install Claircom Air Terminal System	767-200/-300	45	Antenna	0
ST284NY	AT&T Passenger Phone	757-200	45	Antenna	0
SA337AL	Palletized Seating Sys - Cargo Roller	737-200C	?	No History at AAL but in STC file	0
ST350AT	Hushkit - Heavyweight	727-200	CAR 4b	SSID Report Provided (91-054)	0
ST431AT	SATCOM Installation - Collins SAT-906	767 Series	45	Antenna	0
ST553SE	Noise Suppression, Nose Cowls	727-100/-200	CAR 4b	Engine Cowl Mod Only/AFM Change Only	0
ST555SE	Noise Suppression, Slat and Flap	727-100/-200	CAR 4b	AFM Change Only	0
ST601AT	SATCOM Installation	MD11	61	Antenna	0
SA931GL	Air-to-Ground Public Telephone	737-200/-300	?	Surrendered; No History at AAL (AirCal 737s)	0
ST1215AT-D	SATCOM Installation - Collins SAT-906	A300 Series	45	Antenna	0
ST1322AT-D	SATCOM - Marconi Antenna System	767-300	45	Antenna	0
ST1334LA	Installation of Reinforced Cockpit Door	757-200		Considered in Analysis	0
ST1335LA	Installation of Reinforced Cockpit Door	737-800		Considered in Analysis	0
ST1336LA	Installation of Reinforced Cockpit Door	DC9-82/83			0
SA2471NM	Installation of Centerline Overhead Bin	DC10-10/30	22	Significant Change to Ceiling Attachment	0
SA4225NM-D	Sliding Carpet Installation - 757 Cargo	757-200	45	Unknown if CPCP Reviewed	0
SA4226NM-D	Scandanavian Cargo Loading System	757-200	45	Unknown if CPCP Reviewed	0
SA4228NM-D	Install SBC/Sliding Carpet Loading System	757-200	45	Unknown if CPCP Reviewed	0
SA4833NM	Hushkit - Lightweight	727-200	CAR 4b	No Structural Supplemental/AFM Only	0
SA5825NM	Air-to-Ground Communication System	DC9-82	10	Antenna	0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
SA5839NM	Hushkit - Heavyweight	727-200	CAR 4b	No Structural Supplemental/AFM Only	0
SA9015NM-D	Claircom Passenger Phone System	DC9-82/83	10	Antenna	0
SA1195SO	Installation Cockpit Blkhd & Courier Seat Instl Separate Oxygen System for Flight Att.	DC9	CAR 4b		0
SA1360GL	Install Parker Hannifin Freon A/C System	DC8	CAR 4b		0
SA1462GL	Installation of Cargo Handling System in DC8-61F & 63F	DC8	CAR 4b		0
SA1563GL	Stage 3 Hushkit Installation	DC9	CAR 4b		0
SA1613GL	Stage 3 Hushkit Installation	DC9	CAR 4b		0
SA1670GL	Installation Of Loran KLN-88 System	DC9	CAR 4b		0
SA1785GL	Stage 3 Hushkit	DC9	CAR 4b		0
SA1802SO	Instl Cargo Door,Restraint Blkhd,Heavy Floor, Class E Compartment, Pallet Restraint Syst.	DC8	CAR 4b		1
SA1893SO	Instl 9G Barrier Net and Floor Mod	DC9	CAR 4b		0
SA1894SO	Installation Type "C" Containers	DC9	CAR 4b		0
SA1998SO	Installation Cargo Handling System for Type C Container	DC8	CAR 4b		0
SA1998SO	Installation Cargo Handling System for Type C Container	DC9	CAR 4b		0
SA2305SO	Installation of Dual KNS-660 FMS	DC8	CAR 4b		0
SA2594CE	Instl of Single Collins TPR-720 Mode S Transponder	DC9	CAR 4b		0
SA2823CE	Instl of Collins Traffic Alert and Collision Avoidance System TTR-920 (TCAS II)	DC9	CAR 4b		0
SA3086NM	Increase in Maximum Zero Fuel Weight Mod.	DC8	CAR 4b		0
SA3201SO	Top Drawing,MK VII Installation on Mcdonnell Douglas DC-9 Series Aircraft	DC9	CAR 4b		0
SA3300SO	Installation of a Sundstrand MK-VII Ground Proximity & Windshear Warning System	DC8	CAR 4b		0
SA4892NM	Modification Aircraft Installation Noise Reduction Nacelles	DC8	CAR 4b		0
SA5455NM	Modification Aircraft Installation Noise Reduction Nacelles	DC8	CAR 4b		0
ST00393AT	Installation of TCAS II System	767	45		0
ST00670CH	Apollo Navigation Management System, GPS	DC8	CAR 4b		0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
ST00844WI-D	Mod of TCAS II or TCAS-94 (TCAS II) System Installation with Collins TTR-920	DC9	CAR 4b		0
ST00844WI-D	Mod of TCAS II or TCAS-94 (TCAS II) System Installation with Collins TTR-920	767	45		0
ST00881WI-D	Installation-TCAS with Dual ADF System	DC9	CAR 4b		0
ST00973CH	Honeywell Mode S Transponder	DC9	CAR 4b		0
ST00974CH	Automatic Dependent Surveillance Broadcast (ADS-b)	DC9	CAR 4b		0
ST01057CH	ADS-B/CDTI STC Master Drawing List	DC9	CAR4b		0
ST01487CH	Installation TCAS TTR-921 and Mode S TPR901 System	DC8	CAR4b		0
ST01494CH	Instl of TAWS and a Univ. Avionics GPS-1000 Global Positioning System	DC8	CAR4b		0
ST01669AT-D	Instl of Class "E" Provisions, Environmental Control Sys & Smoke Detection System	767	45		0
ST01670AT-D	Installation of Main Deck & Lower Lobe Floor Mod & 9G Restraint Systems	767	45		1
ST01671AT-D	Installation of Main Deck & Lower Lobe Cargo Handling System	767	45		0
ST01779CH	Installation Of An Universal Avionics Terrain Awareness Warning System (TAWS)	DC9	CAR4b		0
ST01807CH	Enhanced Ground Proximity Warning System	767	45		0
ST01985CH	Installation Of An Apollo Navigation Management System	DC9	CAR4b		0
ST00788SE	Installation of a LiveTV Satellite Television System.	A319-111, 112 A318-111 See STC	FAR 25-86		1
ST00535DE	Installation of Multichannel Aircraft Suscriber Equipment (Telephone)	A319-111	FAR 25-86		0
ST00537DE	Installation of Cargo Floor Panel Reinforcements	A319-111, 112	FAR 25-86		0
ST01447NY	Harris Ground Wireless Aircraft Data Link	A320-200	FAR 25-56		0
ST10065SC	Electronic Equipment Rack	A320-232	FAR 25-56		0
ST02483AT	Cabin mounted Video Camera System	A320-Series	FAR 25-56		0
ST01060CH	GPS Antenna Doubler Instl	737-300	?	Did not specify cert basis, probably TC	0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
ST01449CH	GPS Antenna Doubler Instl	757-200	?	Did not specify cert basis, probably TC	0
SA6081NM	Phone Antenna Doubler Instl	737-300	?	Did not specify cert basis, probably TC	0
ST00109LA-D	Phone Antenna Doubler Instl	A320	?	Did not specify cert basis, probably TC	0
ST01625LA	Fuelmizer Instl	737-300	25-71	Only one clearly stated 25.571	0
SA1332SO	Modification of thrust reversers. (727-116)	B 727			0
SA1602NM	Installation of a Lear Siegler performance data computer system.	B 727 B727-100C Series			0
SA1603NM	Cockpit instrument/overhead panel standardization.	B 727			0
SA1604NM	Install IPECO crew seats on flight decks.	B 727			0
SA1747SO	727--25C, S/N 19720, LTN-51 Instl	B 727-25C			0
SA1767SO	727-100/-200 Main Cargo Door Inst.	B 727-100, 200 series			1
SA1768SO	727-200/-200 "E" Class Compartment	B 727-100, 200 series			0
SA1992SO	Installation of modified 727-200 type acoustic nose cowls and acoustic tailpipes.	B 727-100			0
SA2039SO	Installation of the Dual Litton, LTN 72R inertial navigation system.	B 727-100,200 series			0
SA2078SO	This STC certificate represents airworthiness approval of the Litton LTN-92, inertial navigation systems.	DC-10-10 DC-10-30			0
SA2103NM	3M (Ryan) WX-10 stormscope weather mapping systems.	B 727-100C series			0
SA2105SO	Installation of the single Litton LTN-92 inertial navigation system.	B 727-100 series			0
SA2609SO	Installation of Dual Collins FD-110 Flight directors.	B 727-200 series			0
SA2729SO	Installation of SP150 MB V dual channel CAT III automatic landing system.	B 727-200 series			0
SA2849SO	Installation of dual Collins FD-109 flight directors.	B 727-100 series			0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
SA2851SO	Replacement of Garrett low flow control valve, P/N396440-01, P/N B27-36-003-01	B 727-200 series			0
SA2861SO	Installation of a class E cargo compartment smoke detection system.	B 727-100C series			0
SA2920SO	DC10/MD11 Window Plug	MD-11 DC-10			0
SA3175SO	DC10 CRAF Configuration	DC-10			0
SA3993NM	727-100 Hush Kits	B 727-100 series			0
SA4156WE	Installation of a two-place courier seat.	DC-10-10F			0
SA4833NM	727-200 Light Weight Hush Kit.	B 727-200 series			0
SA5839NM	727 Heavy Weight Hush Kit.	Boeing 727-200 series			0
SA7447SW	727-100 modification from an eight unit load device to a nine unit load device configuration. 727-200 modification from and eleven unit load device to a twelve unit load device.	B 727-100,200 series			0
ST00143AT	Installation of a collins ACARS management unit.	MD-11			0
ST00230AT	Installation of a trimble TNL-2100 GPS navigator.	B 727-200 series			0
ST00312AT	Modification to allow passenger to freighter conversion.	DC-10-10			1
ST00350AT	727-200 Hush Kit Structural Provisions.	B 727-200 series			0
ST00368AT	Installation of liquid crystal EADI and EHSI displays.	B 727-200 series			0
ST00453AT	Installation of special equipment and twelve passenger seats for animal charter flights.	MD-11			0
ST00453AT	Installation of special equipment and twelve passenger seats for animal charter flights.	DC-10-10F DC-10-30F			0
ST00542LA	X-Box Cargo System	DC10F MD10F			0
ST01020AT	Installation of modifications for increased capacity air conditioning for upper cabin.	DC-10-30F			0
ST01047LA	Installation of a fan and core cowl wire harness.	DC-10-10 DC-10-10F DC-10-30 DC-10-30F			0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
ST01072LA	Installation of a red cover fuel shut-off handle assembly.	MD-10-10F MD-10-30F			0
ST01115AT	727-200 5 Inch ATI LCD Installation	B 727-200			0
ST01165AT	Installation of a second air conditioning system supply duct in upper cabin & modification of the environmental control system & temperature sensor wiring.	MD-11			0
ST01225AT	Installation of an Aircraft Communication addressing and reporting system(ACARS).	DC-10			0
ST01325AT	Installation of an ARINC 717 digital flight data acquisition data (DFDAU) Allied Signal P/N 967-0214-001.	MD-11			0
ST01393AT	Installation of liquid crystal display electronic attitude direction indicators and horizontal situation indicators (EADI/EHSI)	DC-10			0
ST01691AT	Installation of expanded parameter flight data recorder.	B 727-100 , 200 series			0
ST01955AT	Installation of a triple Rockwell Collins 618M5 VHF transceivers and the replacement of control heads with gables G74406-04 to meet the 8.33 KHz channel space frequencies.	B 727-100, 200 series			0
ST02078AT	Installation of a triple Rockwell Collins VHF 900B transceiver and the replacement of control heads with Gables G7400-13 and G7400-16 to meet the 8.33 KHz channel space frequencies.	Airbus A300, A310 series			0
ST02276AT	Installation of a Rockwell Collins high frequency data link.	MD-11F			0
SA6076NM	Installation of Honeywell TCAS II & Dual Mode-S Transponder Systems	Airbus A300-600			0
ST01477CH	Installation of Onboard Network System	Airbus A300-600			0
ST00747LA-D	Installation of Flight Data Recorder Expanded Parameter Sensors	Airbus A300-600, A310			0
ST00708WI-D	Upgrade ACARS MU To Phase II Software	Airbus A300-600, A310-200			0
ST00440SE	Installation of Honeywell EGPWS	Airbus A300-600, A310-200, A300-300			0
SA5814NM	Installation of Honeywell TCAS II & Dual Mode-S Transponder Systems	Airbus A310-200, -300			0
SA36NW	Installation of Sundstrand MKII GPWS	B727-100			0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
SA604SO	Installation of Dual FD-109 Flight Director Systems	B727-100			0
ST00579SE	Installation of ADS-B	B727-100			0
ST00697AT-D	Conversion From Bendix RDR-1E to Collins WXR-700X Weather Radar System	B727-100			0
SA4834NM	Installation of Honeywell TCAS II & Dual Mode-S Transponder Systems	B727-100, -200			0
SA5105NM	Installation of Allied-Signal MKVII GPWS/Windshear Warning System	B727-100, -200			0
ST00221AT	Installation of Solid State Flight Data Recorder & Expanded Parameters	B727-100, -200			0
ST510SO	Installation of Dual HF Systems	B727-100, -200			0
ST00535SE	Installation of Honeywell EGPWS	B727-100, -200			0
SA1220NW	Installation of Digital Flight Data Recorder	B727-200			0
SA3912NM	Installation of Litton Dual LTN-92 INS Systems	B727-200			0
SA5917SW	Installation of Dual Tracor 7800 VLF/Omega Nav Systems	B727-200			0
ST00556CH	Installation of Dual Honeywell/Trimble HT9100 Global Nav Systems	B727-200			0
ST00935WI-D	Mod. Bendix KNR6030 Nav Receiver (VOR/ILS) System to Collins GNLU-930 Multi Mode Receiver	B727-200F			0
ST00896WI-D	Installation of GLS Data Recording Equipment	B727-200F			0
ST01166CH	Installation of Pilot Access Terminal	MD-11			0
ST01307CH	Installation of Gatelink	MD-11 Boeing MD-10			0
ST00800CH	Installation of OMT	MD-11 Boeing MD-10			0
ST01539CH	Installation of a Smiths Industries Combined Voice and Flight Data Recorder and optional Recorder Control Unit	MD-11 MD-11F			0
ST00503LA	Installation of Securaplane Battery Charger	DC 10-10, -10F, -15, -30, -30F, -40, -40F, MD-10-10F, -30F, MD-11, -11F			0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
SA4836NM	Installation of Honeywell TCAS II & Dual Mode-S Transponder Systems	DC-10-10 DC-10-30			0
SA5794NM	Installation of Allied-Signal MKVII GPWS/Windshear Warning System	DC-10-10 DC-10-30			0
ST00680CH	Installation of Dual Honeywell/Trimble HT9100 GPS Ferry Pallet	DC-10-10 DC-10-30			0
ST00803NY	Installation of IS&S Standby Metric Altimeter	DC-10-30			0
SA5891NM	Installation of Honeywell TCAS II & Dual Mode-S Transponder Systems	MD-11			0
ST00704LA	Installation of Honeywell TCAS II & Dual Mode-S Transponder Systems	MD-11			0
ST00743LA-D	Installation of Control Column & Rudder Pedal Position Sensors for Flight Data Recorder	MD-11 DC-10-10 DC-10-30			0
ST00536SE	Activation of Honeywell EGPWS Peaks & Obstacles Functions	MD-11 MD-10			0
ST00100NY	A310 P-F Conversion	Airbus A310			1
ST01438CH	Inst. Of NASI Vent Door System	B727			1
ST00878CH	Cargo System	A300 Model F4-605R			0
ST00878CH	A300-600 MD Cargo Loading System	Airbus A300 series			0
ST01393NY	A300 Lower Deck Replacement	Airbus A300 A310 series			0
ST504CH	A310/300 MD Cargo Loading System	Airbus A300 A310 series			0
SA1956NM	Cargo System	B727-100			0
SA5015NM	Containers	B727-100, 200 Series			0
SA5041NM	Containers	B727-100, -200 Series			0
SA3113NM	Cargo System	B727-100, -200 Series			0
SA3173NM	Containers	B727-100, -200 Series			0
SA3929NM	Cargo System	B727-100/-100F			0
SA4894NM	Floor Panel Replacement	B727-100C, -200C Series			0
SA4553NM	Cargo System	B727-200, -200F			0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
SA2481NM	Cargo System	B727-233			0
SA1991NM	Cargo System	B727-2S2F, B727-200F			0
ST01338CH	DC 10/MD-10 APU Door Actuation System	Boeing DC 10, MD-10			0
SA5466NM	Belly Cargo System	DC 10 Series			0
ST00502LA	3 Piece 9-G Net Installation	DC 10 Series, MD-11 Series			0
ST00677NY	Emergency Equipment, Slide/Raft	DC 10 Series, MD-11 Series			0
SA3172NM	Containers	DC 10-10, -30			0
SA5040NM	Containers	DC 10-10, -30, MD-11			0
SA5016NM	Containers	DC 10-10, -30, MD-11, A300F4-605R			0
SA4222NM-D	Belly Cargo System	DC 10-10, DC 10-30			0
SA3278SO	Smoke Barrier Installation	DC-10-10, DC-10-30			0
ST00349LA	Inst. Of Cargo Handling Systems	DC 10-10, DC 10-30, MD-10-10, MD-10-30			0
SA5003NM	Inst. Of Cargo Handling Systems	DC 10-10, DC 10-30, MD-10-10, MD-10-30			0
ST00399DE	Inst. Of Nose Radome Shell Assy.	DC 10-10, DC 10-30, MD-10-10, MD-10-30, MD-11			0
ST01120LA	Inst. Of Insulation Blankets	DC 10-10, DC 10-30, MD-10-10, MD-10-30, MD-11			0
SA4920NM	Horse Containers	DC 10-10CF & -30CF			0
SA3415NM	Cargo System	DC 10-10F & DC 10-30F			0
ST00628LA	Containers	DC 10-30F			0
SA6063NM	Seat Pallet Assembly	DC 10-30F			0
ST00152LA	Cargo System	MD-11F			0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
SA4098WE	Cargo System				0
SA298NE	Installation of Simmonds Digital Fuel Quantity Indicating System	B727-100			0
ST00387LA-D	Lower Cargo Smoke Detection and Fire Suppression System	B727-100, -200			0
ST00736SE	727-100/-200 Instl. Of Full Face Oxygen Masks	B727-100, -200			0
SA3468NM	Installation of Smiths Digital Fuel Quantity Indicating System	B727-200			0
SA1474SO	Installation of Winters Auxilliary Fuel Tanks	B727-2S2F			1
SA3432WE	DC 10 Engine/Pylon Fire Detection	DC 10-10, DC 10-30			0
ST01040CH	Flap Position Transmitter	DC 10-10, DC 10-30			0
ST01341CH	Flap Position Transmitter	DC 10-10, DC 10-30			0
ST00113LA-D	Flap Position Indicator	DC 10-10, DC 10-30			0
ST00456AT	Installation of Gull Digital Fuel Quantity Indicating System	DC 10-10, DC 10-30			0
ST00828CH	Flap Position Transmitter	MD-11			0
ST09368SC	3/4 Oxygen Bottle Installation	MD-11 MD-10			0
ST10471AT	Engine Fire Detection Harness Repl.	MD-11 A300-600			0
SA2826WE-D	727-22/-22C/-222 GPWS Installation	Boeing 727-22/-22C/-222			0
SA1949NM-D	Roll & Pitch Computers	DC10-30			0
SA2702NM-D	FMS System	DC10-10			0
SA2711NM-D	EEL Battery	DC10-10, -30			0
SA2726NM-D	ACARS	DC10-30			0
SA2790NM-D	TCAS ll, Mode S	DC10-30			0
SA2794NM-D	Ground Prox, Windshear	DC10-30			0
SA2795NM-D	TCAS	DC10-30			0
SA2756NM-D	TCAS Wiring Provisions	DC10-10			0
SA2782NM-D	TCAS	DC10-10			0
SA2784NM-D	Wiring Provisions Windshear	DC10-10			0
SA2792NM-D	Ground Pro, Windshear Activation, computer	DC10-10			0
SA2817WE-D	Provisions for Ground Prox Warming Sys.	DC10-10, -30F			0

STC Number	**Description**	**Airplane Model(s)**	**Airplane Cert. Basis**	**Comments**	**WFD Assessment Required? 1 = YES / 0 = NO**
SA2830WE-D	Ground Prox Warning Sys. Computer	DC10-10, -30F			0
SA3025WE-D	DME Interrogators Cooling	DC10-10			0
SA3036WE-D	INS System	DC10-10			0
SA3580WE-D	ACARS	DC10-10			0
SA3585WE-D	Flight Management SyS. S/N 47969 only	DC10-10			0
SA5995NM-D	Global Position Sys. Provisions	DC1010			0
SA5996NM-D	SATCOM	DC-10-10			0
ST00008LB-D	HSI/ADI Installation	DC10-10			0
ST00009LB-D	Electronic Resource Sys. Provisions	DC10-10			0
ST00552LA-D	GPS/SATCOM/EFI/ERS Deactivation	DC10-10			0
SA2836WE-D	Bell & Howell Video	DC10-10			0
SA3046SO	TRA-67 Mode S Transponder	DC10-30			0
SA3061SO	CAS8/TCASll	DC10-30			0
SA2459NM	Installation Video Sys.	DC10 Series			0
ST00935LA	Video System	MD-11			0
ST9416SC-D	Installation VHF	MD-11			0
ST00601AT	SATCOM	MD-11			0
SA6076NM	TCAS Sys.	A300B4-600, -600R			0
SA5835NM	Digital Flight Data Inst'l.	A300-200, -300 Series			0
ST00145AT	TCAS, Mode S, WX Radar	A310-200, -300 Series			0
SA3400NM	Floor Prox Lights	A300, A310-200, -300 Series			0
ST01609CH	Combined Voice & FDR. Recorder control Unit	Airbus			0
SA1948NM-D	Passenger Seat Provisions	DC10-30			0
SA2705NM-D	Passenger Seats.	DC10-30			0
SA2755NM-D	Passenger Seating	DC10-30			0
ST00562LA-D	Ribbon Heat Strips, P Water Lines	DC10-30F			0
SA2706NM-D	Galley Lower Conversion	DC10-10			0
SA 2816WE	Inst'l Spacer Pallets	DC10-10			0
SA2837WE-D	Lavatory, Main Deck Flooring	DC10-10			0
SA3031WE-D	Serving Cart Tie Downs	DC10-10			0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
SA3035WE-D	Slide Raft	DC10-10			0
SA3358WE-D	Interior Arrangement	DC10-10			0
SA1144NW-D	Cart Installation	DC10-10			0
SA2720NM-D	Interior Configuration	DC10-10			0
ST00019LB-D	Ribbon Heaters Water Lines.	DC10-10			0
ST00399AT	330 Tourist Class Seating	DC10-10			0
SA2524WE	Inst'l of Seats, Bar, Tables	DC10-10, -10F			0
SA3875WE	Flight Attendant Seat	DC10-10, -10F			0
SA3997SW-D	Electrical power at passenger seats.	MD-11			0
SA3986SW-D	Modify passenger cabin	MD-11			0
SA5928NM	Cargo Liner	A300-600, A310-200,-300 Series			0
ST00355AT	189 Passenger Interior	A310-200 Series			0
SA3134SO	Class Divider, Work Table	A31-200, -300 Series			0
ST00757NY	Food Service Cart	A300B4-600, -600R			0
ST00913NY	Install Meal Cart	A300B4-600, -600R			0
SA1135NW-D	Fan Reverser Fire Proof Blankets	DC10-10, -30			0
SA1947NM-D	Traning Requirements	DC10-30			0
SA3696WE	Training requirements	DC10-10			0
SA3990SW-D	Passenger Cabin Mods	MD-11			0
SA1506NM	Revised Interior	DC-9-82			0
SA1529NM	Revised Interior	DC-9-80			0
SA2424NM	Installation Of Interior Arrangement	DC-9-82			0
SA2732NM	Revised Interior	DC-9			0
SA2734NM	Revised Interior	DC-9			0
SA2739NM	Revised Interior	DC-9-81, -82			0
SA2747NM	Revised Interior	DC-9-81,-82			0
SA2752NM	Installation of Nordskog Galleys	DC-9-81, -82			0
SA2753NM	Revised Interior	DC-9-81,-82			0
SA2877SW	Modify Upper And Lower Galley Attach Points, Install Galleys	DC-9			0
SA3906NM	Installation Of KME Galleys G1 Through G4	DC-9-82			0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
SA4212SW	Installation Of Galley #3	DC-9-14, -15, -31, -32			0
SA4323SW	Two 5-Abreast Seating Arrangements (Limited 29 Inch, 30 Inch, And 31 Inch Spacing)	DC-9-32			0
SA4612SW	Modify Two Existing Forward Double Flight Attendant Seats	DC-9-14, -15, -15F, -31, -32			0
SA4613SW	Modify 2 Existing Aft Flight Attendant Seats	DC-9-15, -15F, -31, -32			0
SA4616SW	Modify Existing Forward Single Flight Attendant Seat	DC-9-14, -15, -15F, -31, -32			0
SA4617SW	Modify Existing Aft Double Flight Attendant Seats	DC-9-14, -31, -32			0
SA5506NM	Installation Of 4 Galleys And One Stowage Unit	DC9-82, MD-82			0
ST0756AC-T	Modification of Existing Side Facing Coat Closet	DC-9-80			0
ST09110AC	Modification of Existing Side Facing Coat Closet	DC-9-80			0
SA1381NM	Inst'l Fwd & Mid Cabin Seating	DC-10-10 DC-10-10F			0
SA2425NM	Installation Of Interior Arrangement	DC-10-30			0
SA2524WE	Installation Of Lounge Seats, Four-Place Divan, L-Shape Bar, And Cocktail Tables	DC10-10-10F			0
SA2984WE	Installation of Buffet/Bar and Bustle Assembly	DC-10-10, -10F			0
SA2985WE	Modification of Installed G1 and G1A Galleys	DC-10-10, -10F			0
SA2987WE	Installation of Cabin Lounge Swivel Seats And Adjustable Table	DC-10-10			0
SA3103WE	Installation of Forward Cabin Convertible Passenger Seats And Associated Oxygen System Modification	DC-10-10, -10F			0
SA3212WE	Installation of Forward Cargo Compartment Positive Vent Sump Drain	DC-10-10, -10F			0
SA3367WE	Installation of Nine-Abreast Coach Seating And Associated Oxygen And Electrical System Modificaitons	DC-10-10, -10F			0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
SA3368WE	Installation of Eight-Abreast Coach Seating In The Forward Cabin Behind The First Class Section And Associated Oxygen And Electrical System Modifications	DC-10-10, -10F			0
SA3407WE	Inst of Lermer Apparatebau GMBH Beverage Cart	DC-10-10, -10CF			0
SA3471NM	Installation of Triple Litton LTN-92 Inertial Navigation System	DC-10-30			0
SA3818NM	Reconfiguration Interior	DC-10-30			0
SA3827WE	Inst'l Folding Leaf Table	DC-10-10 DC-10-10F			0
SA3843WE	Installation Of Galley	DC-10-10			0
SA3844WE	Installation Of Coat Closet	DC-10-10, -10F			0
SA3845WE	Inst'l Buffet / Bar Unit	DC-10-10 DC-10-10F			0
SA3847WE	Installation Of Lounge And First Class Accomodation	DC-10-10, -10F			0
SA3875WE	Installation Of Flight Attendant Seat	DC-10-10, -10F			0
SA3996WE	Installation Of Litton LTN-211 Omega/VLF	DC-10-10, -10F, -30			0
SA4006WE	Installation Of 3-Place Courier Seat	DC-10-10F			0
SA4058WE	Inst'l Folding Leaf Table	DC-10-10 DC-10-10F			0
SA4122WE	Installation Of Aluminum Cabin Window Plug Assembly To Replace Outercabin Window Pane	DC-10-10, -10F			0
SA4158WE	Installation Of Beverage Cart	DC-10-10, 10F			0
SA4372NM	Installation Of Structural Provisions for Galley G1A	DC10-20 S/N 46576			0
SA4373NM	Installation Of Structural Provisions for Galleys G1, G2, G3, G5, G6, and G7	DC10-30			0
SA5872NM	Installation Of Seat Tracks	DC-10-30			0
SA5894NM	Installation Of Galleys and Stowage Compartments	DC-10-30			0
ST09183AC	Installation Of G1 Galley	DC10-30			0
ST09184AC	Installation Of G2 Galley	DC10-30			0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
ST09185AC	Installation Of G3 Galley	DC10-30			0
ST09186AC	Installation Of G5 Galley	DC10-30			0
ST09187AC	Installation Of G6 Galley	DC10-30			0
ST09188AC	Installation Of G7 Galley	DC10-30			0
ST09302AC	Fabrication/Installation G1 & G2 Galleys	DC-10-30			0
ST09303AC	Fabrication/Installation G3, G5, G6, G7 Galleys	DC-10-30			0
ST09405AC	Fabrication/Installation Lower Galley Modules	DC-10-10			0
SA1304NM	Inst'l Dual Litton 211 Omega / VLF Navigation Systems	B727-100/-200			0
SA2048NM	Interior Modification	B727-224			0
SA2672WE	Installation Of A Coat and Luggage Stowage Unit	B727-200			0
SA2886WE	Interior Arrangement	B727-24C, -92C			0
SA2899WE	Installation Of A Courier Seat	B727-24C, -92C			0
SA2942WE	Inst'l Nordskog Galleys	B727-24C			0
SA3153WE	Inst'l Fwd Coat Closet	B727, 727C, 727-100, 727-100C			0
SA3408WE	Installation of Lermer Apparatebau GMBH Beverage Cart	B727-30, -224			0
SA3488WE	Inst'l Cabin Divider	B727-92C, SN 19174			0
SA3521WE	Installation of A Cabin Divider	B727, -100, -200, -100c			0
SA3655WE	Installation of Nordskog Co. Auxiliary Galley	B727-22, -24C, -30,			0
		-76, -92C			0
SA3717WE	Installation of Cabin Divider	B727, 727C, -100, 100C			0
SA4133WE	Installation of an ARINC Communications Addressing and Reporting System (ACARS)	B727-100, -200			0
SA4157WE	Installation of Beverage Cart	B727-22, 24C, -30, -76, -92C, -224			0
SA5477NM	Galley Reconfiguration And Installation	B727-200			0
ST115RM	Installation of Interior Arrangement	B737-248			0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
ST116RM	Installation of Interior	B737-219			0
ST139RM	Installation of Interior Arrangement	B737-2A1			0
ST158RM	Installation of Interior Arrangement	B737-291			0
SA1540NM	Installation Of Grimes Galley	B737-200			0
SA1550NM	Installation of Provisioned Wiring And Hardware For Sperry Performance Management System	B737-291			0
SA1965WE	Interior Arrangement Modification	B737-2C0, -214, -291			0
SA2491WE	Installation of Frontier Airlines Galley Tray Cart	B737-291, -2CO, -214, -2H4			0
SA2731NM	Revised Interior	B737-200			0
SA55RM	Installation Galley Tray Cart	B737-200			0
SA6RM	Interior Arrangement Modification	B737-2C0, -2H4, -212,-214,-291,-222			0
SA62RM	Installation Beverage Cart	B737-200			0
SA66RM	Revision of Aft Coat Closet Capacity From 100 lbs. to 250 lbs.	B737-2CO, -2H4, -212, -247, -291			0
SA67RM	Installation of Trash Module In Aft Coat Closet	B737-2CO, -2H4, -212, -214, -222, -247, -291			0
SA75RM	Installation of Mapco Closet Module Under Forward Left Side Hatrack	B737-2CO, -2H4, -212,-214, -222, -247, -291			0
SA8990SW	Installation Of A Slimline Under-Bin G2 Galley	B737-200			0
ST09460AC	Fabrication & Instl of Ceiling Bin, Raft Stowage	B737-300			0
ST09462AC	Fabrication & Instl of Class Dividers	B737-300			0
ST09467AC	Fabrication & Instl of Galleys & Closets	B737-300			0
ST09469AC	Installation Of G2 Galley & Closet	B737-300			0
ST09549AC	Installation of Class Dividers	B737-800			0
SA7016NM-D	Modification Of Interior Configuration, Installation Of Electrically Operated Seats, And Installation Of Individual In Seat Video System	B757-200			0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
ST09554AC	Installation of SAT-2000 Satellite Communications System	B767-200			0
SA2195WE	Interior Arrangement	B747			0
SA3547WE	Installation of Cargo Container	B747-100			0
SA2265WE	Change Of Seating Configuration To Add Bar.	B747-124			0
SA2276WE	Interior Arrangement Modification	B747-124			0
SA5496NM	Installation/Relocation Of Sell Galleys And Provisions For Passenger Overhead Stowage Bins	B747-230B			0
SA1900SO	Installation of Airfone Air/Ground Telephone System	A300B4			0
ST00840SE	Rearrangement-C80→K51-K54	747-400	Pre-45	JAPAN STC-101-TYO	0
ST00822SE	Rearrangement-K05 to K25 Seat Configuration	747-400	Pre-45	JAPAN STC-97-TYO	0
N/A	Conversion-K25 to K23/k24 Seat Configuration	747-400	Pre-45	JAPAN STC-98-TYO	0
ST00252WI	Conversion-PAX Aircraft to Special Freighter	747-200B	Pre-45	JAPAN STC-2-HQT	1
ST00857SG	Installation-U/D Galley to Special Freighter	747-200B	Pre-45	JAPAN STC-3-HQT	0
ST00853SE	Rearrangement-C71 to C72 Seat Configuration	747-400	Pre-45	JAPAN STC-104-TYO	0
N/A	Installation-Crew Rest Seat at Door 4	747-400	Pre-45	JAPAN STC-106-TYO	0
N/A	Installation-Crew Rest Seat at Door 4	747-300	Pre-45	JAPAN STC-108-TYO	0
ST00705SE	Installation-EGPWS (747 Conf.1)	747	Pre-45	JAPAN STC-117-TYO	0
ST00536SE	Installation-EGPWS (DC-10 Without TERR Display)	DC-10	Pre-45	JAPAN STC-120-TYO	0
N/A	Rearrangement-K25 to K27 Seat Configuration	747-400	Pre-45	JAPAN STC-98-1-TYO	0
N/A	Rearrangement of U/D Compt B,C - Business Class Seat with IFE and Coat Closet installation	747-400	Pre-45	JAPAN STC-123-TYO	0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
N/A	Installation-L4 Crew Rest Curtain	747-400	Pre-45	JAPAN STC-116-TYO	0
N/A	Installation-Closet/Stowage	DC-10	Pre-45	JAPAN STC-119-TYO	0
N/A	Rearrangement Configuration	747-300	Pre-45	JAPAN STC-140-TYO	0
ST8072LA-T	Avionics In-Flight Systems Index list 246212 Rev. A - MDDS System Installation	747-300	Pre-45	JAPAN STC-141-TYO	0
N/A	Rearrange - A32 to A33 with Recaro	767	BTWN	JAPAN STC-131-TYO	0
N/A	Installation - Curtain for L4 Crew Rest	747-300	Pre-45	JAPAN STC-139-TYO	0
N/A	B07 Seat Configuration to B99 Seat Configuration	747-200B	Pre-45	JAPAN STC-4-HQT	0
ST01128SE	Interior Reconfiguration (Shell Flat Seat Installation)	747-400	Pre-45	JAPAN STC-152-TYO	0
N/A	Medical Equipment Installation	747-400	Pre-45	JAPAN STC-148-TYO	0
N/A	Stretcher Installation	767-300ER	BTWN	JAPAN STC-156-TYO	0
N/A	Stretcher Installation	777-200ER	Post-54	JAPAN STC-157-TYO	0
N/A	Crew Rest Curtain Installation	777-200ER	Post-54	JAPAN STC-153-TYO	0
N/A	Cockpit AFT Curtain Installation	767-300ER	BTWN	JAPAN STC-159-TYO	0
N/A	Cockpit AFT Curtain Installation	777-200ER	Post-54	JAPAN STC-158-TYO	0
ST01391LA Amendment	Replacement - FLT Compt Door	DC-10 MD-11	Pre-45 Post-54	JAPAN STC-155-TYO JAPAN STC-155-1-TYO	0
N/A	B99 Seat Configuration to B09 Seat Configuration	747-200	Pre-45	JAPAN STC-164-TYO	0
ST01152SE Amendment	747-400D UD Big Bin Modification	747-400	Pre-45	JAPAN STC-167-TYO	0
ST01391SE	Installation - New Class Seat	777-200	Post-54	JAPAN STC-199-TYO	0
N/A	Installation - Handicap Economy Class Seat	747-400	Pre-45	JAPAN STC-190-TYO	0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
N/A	Installation - Galley Insert, 747-400D New A2 Galley	747-400	Pre-45	JAPAN STC-191-TYO	0
N/A	Rearrangement - A13 to A14	767	BTWN	JAPAN STC-180-TYO	0
ST01352SE	Rearrangement - A13 to A14	767	BTWN	JAPAN STC-181-TYO	0
ST01365SE	Installation - New Solo Seat	400	Pre-45	JAPAN STC-192-TYO	0
N/A	Bed Installation（P/N 123000-300)	747-400	Pre-45	JAPAN STC-193-TYO	0
ST00773SE Amend	Installation - U/D Big Bin 747-400 Int	747-400	Pre-45	JAPAN STC-134-1-TYO	0
ST01472LA-D 2004-5-25	Installation - Cockpit Door Surveillance Camera	747-200 747-400	Pre-45	JAPAN STC-201-TYO JAPAN-STC-210-TYO	0
N/A	Rearrangement - A20 to A22	767-300	BTWN	JAPAN STC-205-TYO	0
ST01423SE	Replace - Seat Track For New Seat Installation	767-300	BTWN	JAPAN STC-206-TYO	0
ST02861AT	Installation - Broadband SATCOM System for CBB (Conexion by Boeing) System	747-400	Pre-45	JAPAN STC-217-TYO	0
ST01691LA	Installation - Cockpit Door Surveillance Camera	767-200 767-300	BTWN	JAPAN STC-215-TYO	0
N/A	Insstallation - Baby Bassinet	767-300	BTWN	JAPAN STC-219-TYO	0
N/A	Bed Installation（P/N 123000-300)	767-200	BTWN	TBD	0
ST01741LA	Installation - Cockpit Door Surveillance Camera	777	Post-54	JAPAN STC-225-TYO	0
ST165CH, SA1785GL, SA1613GL	Hushkits	DC-9	Car 4		0
	P-F Cargo Door Installation	747			1
	Weight Increases	none for NWA			0
	TCAS Antenna	747			0
SA4853NM	TCAS Antenna	DC-9			0
	TCAS Antenna	DC-10			0
	TCAS Antenna	A320/319			0
	TCAS Antenna	A330			0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
ST00385-LA-D, ST00391LA-D, ST00392LA-D, ST00393LA-D	Cargo Compt Halon Bottle Instl	DC-9	Car 4		0
	GPS Antenna	757	25.45		0
	GPS Antenna	747			0
ST01167CH	GPS Antenna	DC-9			0
	GPS Antenna	DC-10			0
	GPS Antenna	A320/319			0
	GPS Antenna	A330			0
	Phone antenna	747			0
ST00032NY	Phone antenna	DC-9			0
	Phone antenna	DC-10			0
	Phone antenna	A330			0
	Cargo Compartment Loaders (Telair)	757	25.45		0
ST00434LA-D	Cabin Pressure System Cutout	DC-9			0
ST00433LA-D ST00201SE ST00450SE ST00396SE	AIM Interior Galley, Drain Mast Cutout	DC-9			0
ST00201SE	LAV Service Panel Cutout	DC-9-30			0
SA9040NM-D	Video System	757	25.45		0
SA1040NE	Installation of the Claircom air to ground telephone system.	DC9			0
SA1177CE	Installation of Collins FPC-75 ground proximity warning system.	DC9			0
SA2594CE	Install single Collins TPR-720 Mode S Transponder	DC9			0
SA3950NM SA4853NM	TCAS II	DC9			0
ST00293LA-D	Active Noise/Vibration Control System (Barry Controls STC)	DC9			0
ST00336LA	Installation of Securaplane battery charger system.	DC9			0

STC Number	**Description**	**Airplane Model(s)**	**Airplane Cert. Basis**	**Comments**	**WFD Assessment Required? 1 = YES / 0 = NO**
ST00385LA-D ST00390LA-D ST00391LA-D ST00392LA-D ST00393LA-D	Installation of provisions for smoke/fire dectection/suppression system, lower cargo compartments.	DC9			0
ST393CH	Installation of a Rosemount model0861FG4 angle of attack sensor.	DC9			0
ST536CH	Installation of Rosemount Aerospace Model 0070J Flap Position Transmitters.	DC9			0
SA1215EA	Installation of Air Cruisers slide/raft evacuation system	747			0
SA1728GL	Install an air to ground telephone communication system (Seatfone)	747			0
SA1307GL	Install cargo conveyer system	747			0
SA1955NM	Installation of Brownline Center Guide Assembly, P/N 46675-101	747			0
SA223NE	Installation of Inflight Service Video Projection System	747			0
SA2440NM	Installation of a Hughes-Avicom video Entertainment System	747			0
SA252NE	Installation of Inflight Services video projection system	747			0
SA2636CE	Install dual Collins TPR-720 Mode S transponders	747			0
SA4204NM-D	Installation of one (1) crew rest area(non-flight crew).	747			0
SA4750NM	Installation of a crew rest area, a flight deck seat and non-operating video monitor	747			0
SA4885NM	Installation of Honeywell Traffic Alert and Collision Avoidance System (TCAS II)	747			0
SA5865NM	Manufacture and installation of a cargo transfer system	747			0
SA5881NM	Installation of Video Entertainment System	747			0
ST00058LA	Installation of cargo handling system, lower bay	747			0
ST00255WI-D	Conversion of a passenger airplane to a main deck side cargo door dedicated special freighter	747			1
ST00425CH	NWA Enhanced GPWS Antenna, 747 aircraft	747			0
ST00634LA	Installation of IIMorrow navigation management system, with global positioning navigation sensor	747			0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
ST01367AT	Installation of upper deck crew rest module, P/N 5310100-1	747			0
SA1007GL	Installation of air to ground public telephone communication system	757			0
SA3475NM	Installation of a Hughes-Avicom video entertainment system	757			0
SA403NE	Installation of video monitor system	757			0
SA4839NM	Installation of provisions for wiring and hardware for Honeywell Traffic Alert and Collision Avoidance System (TCAS II)	757			0
SA5831NM	Installation of USA Today sky radio	757			0
SA9013NM-D	Installation of Claircom passenger phone system	757			0
SA3804NM	INSTALLATION OF THE CENTERLINE SKYBIN STOWAGE INTERIOR KIT W/ PSU PROVISIONS IN THE DC10-30	DC-10			0
SA5836NM	INSTALLATION OF LITTON DUAL LTN-2001 GLOBAL POSITIONING SENSORS (GPS)	DC-10			0
ST00078LA	INSTALLATION OF INERTIAL NAVIGATION SYSTEMS AND DUAL LTN-2001 GPS	DC-10			0
ST00225NY	INSTALLATION OF CLAIRCOM AIR TERMINAL SYSTEM	DC-10			0
ST00584LA	INSTALL. CENTERLINE BIN KIT	DC-10			0
ST01026AT	Installation of global positioning system monitoring unit.	DC-10			0
SA5800NM	Installation of Honeywell TCAS system	A320/319			0
SA5859NM	Installation of video entertainment system	A320/319			0
ST01181NY ST01182NY	Installation of Claircom Air Terminal Systems	A320/319			0
ST133CH	Installation of Sky radio receiver system	A320/319			0
SA2747NM-D	Install air-ground telephone system (antenna hull penetration)	737-300	pre 45		0
SA2763NM-D	TCAS (antenna hull penetration)	737-300	pre45		0
ST09191AC	Devore Position Light (hull penetation)	737-300	pre45		0
SA5634NM-D	SatCom Instl (antenna hull penetration)	747-400	pre 45		0
SA2767NM-D	air-ground telephone (antenna hull penetration)	757	45		0
SA2704NM-D	air-ground telephone (antenna hull penetration)	767-200	45		0

STC Number	**Description**	**Airplane Model(s)**	**Airplane Cert. Basis**	**Comments**	**WFD Assessment Required? 1 = YES / 0 = NO**
SA5991NM-D	SatCom Instl (antenna hull penetration)	767-300	45		0
SA6044NM	GPS antenna	767-300	45		0
SA1889SO	Installation of Emergency Escape Path Lighting System	737-200, -300	A16WE		0
SA2401SO	Installation of Aft Centerline Trash Container	737-200, -300	A16WE		0
SA3140NM	Installation of Floor Proximity Emergency Escape Path Marking System (Bruce Industries)	737-200, -300	A16WE		0
SA3456NM	Installation of C & D Interiors Class Divider	737-200, -300	A16WE		0
SA1339GL	Installation of GTE Airfone Public Telephone System	737-200,-300,-400	A16WE		0
SA1529GL	Installation of E3-6 Electronic Equip. Rack	737-200,-300,-400	A16WE		0
SA2065SO	Reconfiguration of 737-300 Pax Seating to an 8F/120Y Mixed Class Configuration in Accordance with USAir Drawing 5H2540685	737-300	A16WE		0
SA2066SO	Installation of Curtain Header	737-300	A16WE		0
SA2351SO	Installation of Galley Inserts	737-300	A16WE		0
SA2353SO	Installation of USAir Seats in Piedmont All Tourist Seating Cabin Configuration	737-300	A16WE		0
SA2453SO	Installation of Galleys per PIE EA 737-1221	737-300	A16WE		0
SA2455SO	Installation of Class Divider per PIE EA 737-1223	737-300	A16WE		0
SA2456SO	Galley Modifications per PIE EA 737-1225	737-300	A16WE		0
SA2725SO	Installation of Bendix/King CAS-81 TCAS II System	737-300	A16WE		0
SA3443NM	Installation of a Video Projection System	737-300	A16WE		0
ST00132NY-D	Seating Configuration	737-300	A16WE		0
ST00740LA-D	Instl. of Smoke Detection & Fire Suppression Systems	737-300	A16WE	Bottle instl.on BS 727 BHD Beams.	0
SA2410SO	Installation of a Cabin class Divider Curtain Header	737-300, -400	A16WE		0
SA2454SO	Installation of Fwd LH Closet	737-300, -400	A16WE		0
SA6081NM	Install Air-to-Ground Passenger Comm. System	737-300, -400	A16WE		0
SA553NE	PATS Installation of 425 or 500 Gallon Aux. Fuel System in Aft Cargo Compartment	737-300/-400	A16WE	Doublers on Center Wing Tank Skin	1

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
ST00003NY	Replace existing FDR with Fairchild solid state digital flight recorder	737-300/-400	A16WE		0
ST00115NY-D	Installation of Optical Quick Access Recorder (OQAR) (Amended 7/30/96)	737-300/-400	A16WE		0
SA1080NE	Reconfiguration of 737-400 Pax Seating to an 8F/138Y Mixed Class Configuration in Accordance With USAir Dwg 5C2540166 Rev. "E" Dated 1/27/93. (Amended 1/12/96 7/16/97)	737-400	A16WE		0
SA2408SO	Installation of the Avicom International Video Entertainment System	737-400	A16WE		0
SA2653SO	Rework of Galleys	737-400	A16WE		0
SA2741SO	Installation of Bendix/King CAS-81 TCAS II and Compatible Mode "S" Transponders	737-400	A16WE		0
ST00112NY-D	737-400 HF/SELCAL	737-400	A16WE		0
ST00114NY-D	737-400 Overwater Installation of C & C Left Hand Class Divider	737-400	A16WE		0
ST00404LA-D	Instl. of Smoke Detection & Fire Suppression Systems	737-400	A16WE	Bottle instl.on BS 727 BHD Beams.	0
SA1727GL	In-Flight Phone Equipment Installation (Reference SA5527NM & SA1319GL)	757 (EX-EAL)	A2NM		0
SA5527NM	Seat Rework per SB 7090-25-001 for Both Weber 4000 & PTC 950	757 (EX-EAL)	A2NM		0
SA1329GL	For Antenna & Rack Installation	757(Ex-EAL)	A2NM		0
SA2853SO	Installation of Bendix/King CAS-81 TCAS II System	757-200	A2NM		0
SA5731NM	Installation of a Windscreen Which Includes a Flight Attendant Seat	757-200	A2NM		0
SA5750NM	Installation of a Windscreen and a Triple Seat	757-200	A2NM		0
SA5751NM	Installation of Closet Provisions	757-200	A2NM		0
SA5754NM	Installation of Three Galleys	757-200	A2NM		0
SA5819NM	Installation of Closet and Class Divider	757-200	A2NM		0
ST00103NY-D	Underbin Class Closet Installation - G2A Position	757-200	A2NM		0
ST00104NY-D	Installation of Cabin Class Divider Curtain Header	757-200	A2NM		0
ST00105NY-D	Mixed Class Seating Reconfiguration - 24F/158Y (amended 4/23/97)	757-200	A2NM		0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
ST00106NY-D	Installation of the Avicom Six Inch LCD Video Monitor on the Class Divider	757-200	A2NM		0
ST00113NY-D	Replacement of Hughes Video Monitors with Sony Video	757-200	A2NM		0
ST00119NY-D	Air Conditioning - Ventilation Aft Equip/Lav/Galley Vent System Modification	757-200	A2NM		0
ST00133NY-D	Pax Seat/Int Accommodiation Layout/Installation	757-200	A2NM		0
SA2836SO	Installation of Galley Cart P/N 397100-3	767-200	A1NM		0
ST00101NY-D	Closet Installation - BA Wet Lease	767-200	A1NM		0
SA1674GL	For Antenna & Rack Installtion	767-200,-300	A1NM		0
ST00108NY-D	Installation of LH & RH Modified Video Monitors (Amended June 2, 1994)	767-200ER	A1NM		0
ST00124NY-D	Install Optical Quick Access Recorder (OQAR)	767-200ER	A1NM		0
ST00130NY-D	Instll of Aft Cargo Bay Avionics Racks	767-200ER	A1NM		0
ST00134NY-D	Instl. a Modified Teledyne Digital Flight Data Acquisition Unit (DFDAU)	767-200ER	A1NM		0
ST00129NY-D	Reconfig of Pax Cabin to Single Class Layout	A319	A28NM		0
SA1693GL	Instl of GTE Airfone	A319, A320	A28NM		0
ST00131NY-D	Install 8.33 VHF Communications system	A320	A28NM		0
ST00951LA	Instl. of Pax Entertainment System	A330	A46NM		0
ST00135NY-D	Instl. of a Bassinet	A330-323	A46NM		0
SA863EA	Interior Conversion - Chromalloy Emergency Lighting Slide	PICO			0
AAN 27564	Installation of Honeywell Mark V EGPWS	B737-382	pre amdt 45		0
ST00657SE	Installation of Heath Tecna ATIX2 Interior retrofit kit.	B737-382	pre amdt 45	FAA STC validated by CAA	0
ST00127BO	BF Goodrich Aerospace transient suppression unit for fuel quantity indication system AD Compliance (FAA AD 99-03-04)	B737-382	pre amdt 45	FAA STC validated by CAA	0
ST01335LA	Instn. of C & D Aerospace reinforced cockpit door.	B737-382	pre amdt 45	FAA STC validated by CAA	0
ST00971SE-D	Instn of BF Goodrich Aviation Technical Services cockpit door surveillance system.	B737-382	pre amdt 45	FAA STC validated by CAA	0
AAN 27482	Instn of ACAS II	737-36N and -37Q	pre amdt 45		0
AAN 27733	ACAS II software update	737-300	pre amdt 45		0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
AAN 26488	Certification of B737-36Q / -36N in the transportation category.(passenger)	737-36Q /-36N	pre amdt 45		0
AAN 26445	Omnibus mod for cabin interior changes of B737-3L9	737-300	pre amdt 45		0
AAN 27717	Omnibus Mod - UK certification and BA reqts for B737-300	737-3Y0	pre amdt 45		0
AAN 24692	Club Europe Relaunch	737-400	pre amdt 45		0
AAN 25691	Instn of Honeywell TCAS II system	737-436	pre amdt 45		0
AAN 25695	Instn of Honeywell TCAS II system and Mode S transponders	737-4S3	pre amdt 45		0
AAN 26313	Instn of Allied signal EGPWS.	737-436	pre amdt 45		0
AAN 27734	ACAS II	737-400	pre amdt 45		0
AAN 25992	Omnibus Mod - Introduction into service of Boeing 737-4S3 for GB airways	737-4S3	pre amdt 45		0
AAN 27070	Omnibus mod - intro of project magic	737-436	pre amdt 45		0
AAN 27215	Intro into service of Boeing 737-59D	737-59D	pre amdt 45		0
AAN 26385	Repair to Fuselage structure, section 41	737-4Q8	pre amdt 45		0
ST00971SE-D	Insn. Cockpit Door Security System	737-400	pre amdt 45	FAA STC Validated by CAA	0
ST00782SE	ATI Bin Extension	737-4Q8	pre amdt 45	FAA STC Validated by CAA	0
AAN 26788	Instn of a Meggitt avionics Secondary Flight Display System.	737-528	pre amdt 45		0
AAN 27553	Instn of ACAS II	737-59D	pre amdt 45		0
AAN 27554	Introduction of EGPWS and PWS	737-505	pre amdt 45		0
AAN 27215	Intro into service of Boeing 737-59D	737-59D	pre amdt 45		0
AAN 27346	Instn of ACAS II	737-528	pre amdt 45		0
AAN 25427	SATCOM Installation	B747-436	pre amdt 45		0
AAN 27539	MORS cabin telecom unit installation	B747-436	pre amdt 45		0
AAN 27475	Instn. of World Traveller Plus seats	B747-436	pre amdt 45		0
AAN 25224	Instn. of First Class Slingshot	B747-436	pre amdt 45		0
AAN 26421	Omnibus Mod - World Traveller re-launch	B747-436	pre amdt 45		0
AAN 26794	Omnibus Mod - Project 'Dusk'	B747-436	pre amdt 45		0
ST00497SE	Door 5 extended crew rest area	B747-436	pre amdt 45		0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
ST00837LA	Instn. Telair Cargo Load System (IPL)	B747-436	pre amdt 45		0
AAN 24639	Interactive Video System	B747-436	pre amdt 45		0
ST01681CH	Insn. Cockpit Door Security System	B747-436	pre amdt 45		0
ST01471SE	Instn. of Elementary and Enhanced Mode S	B747-436	pre amdt 45		0
AAN 28527	Security Flight Deck Door	B747-436	pre amdt 45	Approval of Boeing SB's747-25-3302, 3306, 3312, 3314, 3321	0
ST02617AT and TA0692	Instn. of Connexion by Boeing	B747-436	pre amdt 45		0
AAN 21412	Instn of ARINC communication addressing and reporting system and VHF transceiver	757-236	post 45 pre 54		0
AAN 24418	Instn. of Terrestrial Flight Telephone System	757-236	post 45 pre 54		0
ST00976SE-D	Insn. Cockpit Door Security System	757-236	post 45 pre 54	CAA TCDS FA28	0
AAN 20109	Instn. of Evacuation Alarm System	757-236	post 45 pre 54		0
AAN 22098	Instn. of 3 Life Rafts and Survival Equipment for Overwater Operatoins	757-236	post 45 pre 54		0
AAN 24336	Club Europe Re-launch	757-236	post 45 pre 54		0
AAN 20091	Instn. of Toilet Smoke Detectors	757-236	post 45 pre 54		0
AAN 20150	Instn. of Floor Proximity Escape Path Marking	757-236	post 45 pre 54		0
AAN 23308	Instn. of Traffic Alert and Collision Avoidance System	757-236	post 45 pre 54		0
AAN 25690	Instn. of Honeywell TCAS II System	757-236	post 45 pre 54		0
AAN 25694	Instn. of Honeywell TCAS II System	757-236	post 45 pre 54		0
AAN 26310	Instn. of Enhanced Ground Proximity Warning System	757-236	post 45 pre 54		0
AAN 26612	Instn. of ILS Only Muti-Mode Receiver	757-236	post 45 pre 54		0
AAN 23073	Revised seating configuration	B767-336	post 45 pre 54		0
AAN 24039	Installation of metric altimeter	B767-336	post 45 pre 54		0
AAN 27446	Introduction of ACAS II	B767-336	post 45 pre 54		0

STC Number	Description	Airplane Model(s)	Airplane Cert. Basis	Comments	WFD Assessment Required? 1 = YES / 0 = NO
AAN 24158	AFM change AP/FD system	B767-336	post 45 pre 54		0
AAN 24341	Introduction of EGPWS	B767-336	post 45 pre 54		0
ST01753CH	Insn. Cockpit Door Security System	B767-336	post 45 pre 54	FAA STC Validated by CAA	0
ST01485SE	Instn. of Elementary and Enhanced Mode S	B767-336	post 45 pre 54	FAA STC Validated by EASA. A1NM	0
ST00852SE	Instn of overhead bin extensions	B767-300	post 45 pre 54	FAA STC Validated by CAA. CAA TCDS FA33.	0
EASA.A.S. 00607	Instn. of Dusk Configuration	B767-336	post 45 pre 54		0
EASA.A.S. 00606	Instn. and Activation of GPS to EGPWC	B767-336	post 45 pre 54		0
EASA STC TBD	Instn. of TES	B767-336	post 45 pre 54		0
EASA.A.S 01142	Replacement of Galley 3A	B767-336	post 45 pre 54		0
AAN 27175	Certification of the A319-131 in the transport category(passenger)	A319-131	post 54		0
AAN 24900	Club Europe relaunch including new convertible seats	A320-111	post 54	Mod 25G166	0
AAN 25696	Installation of Honeywell ACAS II (Change 7)	A320-111 /-211	post 54	Mod 34G465	0
AAN 26314	Instalation of an Allied signal EGPWS	A320-111 / 211	post 54	Mod 34G252	0
AAN 26087	Omnibus mod for interior of A320-231	A320-231	post 54		0
ST00901SE	Instn. of Overhead Attendant Rest Area	B777-236	post 54		0
AAN 27608	Instn. of Phase II First Class Seats	B777-236	post 54		0
AAN 27167	Instn. of Flight Crew Rest Area	B777-236	post 54		0
AAN ST01717CH	Cockpit Door Surveillance System	B777-236	post 54	FAA STC Validated by CAA	0
AAN 28578	Omnibus Mod. Three Class Conversion (Dusk)	B777-236	post 54		0
ST01717CH	Instn of Floor mounted Stowage	B777-236	post 54	FAA STC Validated by CAA	0
AAN 28879	Instn. of Two L.H Wardrobes	B777-236	post 54		0
AAN 27337	Fuselage Damage Repair	B777-236	post 54		0

STC Number	**Description**	**Airplane Model(s)**	**Airplane Cert. Basis**	**Comments**	**WFD Assessment Required? 1 = YES / 0 = NO**
EASA IM.A.S.0190	Instn. of Elementary and Enhanced Mode S	B777-236	post 54	FAA STC Validated by EASA	0

<u>Appendix H: AAWG Meetings and Attendance Records</u>

1. Meeting Dates and Venues

AAWG Meetings

July 23, 2003	--	Atlanta Georgia (Delta Air Lines)
June 30, 2004	--	Long Beach CA (FAA)
March 1, 2005	--	Miami FL (Airbus)
October 26, 2005	--	Memphis TN (FedEx)
January 25, 2006	--	Miami FL (Airbus)
May 3, 2006	--	Long Beach CA (Boeing/FAA)
June 28, 2006	--	Miami FL (Airbus)
August 30, 2006	--	Washington DC (Boeing)
March 14, 2007	--	Seattle WA (Boeing)

Task Group Meetings

Ad-hoc Task Planning Group		
September 15-17, 2003	–Mtg 1	Seattle Washington (Boeing)
November 11-14, 2003	–Mtg 2	London England (British Airways)
March 29-April 2, 2004	–Mtg 3	Toulouse France (Airbus)
May 17-21, 2004	–Mtg 4	Memphis Tennessee (FedEx)
Task Group Meetings		
July 12-16, 2004	–Mtg 1	Gatwick England (CAA-UK)
September 20-21, 2004	–Mtg 2	Long Beach (Boeing)
November 15-19, 2004	–Mtg 3	Brussels Belgium (FAA)
January 31- Feb 4, 2005	–Mtg 4	Miami FL (Airbus)
March 14-18, 2005	–Mtg 5	Hamburg GE (Airbus)
May 2-6, 2005	–Mtg 6	Long Beach CA (FAA/Boeing)
June 13-19, 2005	–Mtg 7	Collioure FR (Airbus)
September 26-30, 2005	–Mtg 8	Seattle WA (Boeing)
November 7-11, 2006	--Mtg 9	Bristol UK (Airbus)
January 23-27, 2006	--Mtg 10	Miami FL (Airbus)
March 6-10, 2006	--Mtg 11	Seville SP (Airbus)
May 1-5, 2006	--Mtg 12	Long Beach CA (FAA/Boeing)
July 10-14, 2006	--Mtg 13	Brussels Belgium (FAA)
October 23-27, 2006	--Mtg 14	Seattle WA(Boeing)
December 4-8, 2006	--Mtg 15	Hamburg GE (Airbus)
January 15-19, 2007	--Mtg 16	Miami FL (Airbus)
February 19-23, 2007	--Mtg 17	Toulouse Fr (Airbus)

2. AAWG Organizational Meeting Attendance

	MEETING DATE							
Organization	**07/03**	**06/04**	**03/05**	**10/05**	**01/06**	**05/06**	**08/06**	**03/07**
Airborne Express (M)	X	X	X	X		X	X	X
Airbus (M)	X	X	X	X	X	X	X	X
ALPA								
America West								
American Airlines (M)	X	X		X	X	X	X	X
ATA (M)				X				
Boeing (M)	X	X	X	X	X	X	X	X
British Aerospace (M)	X							
British Airways (M)	X	X		X	X			X
CAA-UK(JAA) (M)	X							
Continental Airlines (M)	X	X	X	X	X	X	X	X
Delta Air Lines (M)	X	X						
Evergreen Aviation								
FAA (M)	X	X	X	X	X	X	X	X
Federal Express (M)	X	X	X	X	X		X	X
Fokker Services								
IATA								
Japan Air Lines		X						
Lockheed (M)	X							
Northwest Airlines (M)		X	X	X	X		X	X
SIE		X				X		
TIMCO		X						
United Airlines (M)	X	X	X		X	X		X
UPS (M)	X	X	X	X				X
US Airways (M)	X	X		X	X		X	

(M) – AAWG Voting Member

3. AAWG Task Planning Group Organizational Attendance

	MEETING DATES			
Organization	**Sep 2003**	**Nov 2003**	**Mar 2004**	**May 2004**
Airborne Express	X	X		X
Airbus	X	X	X	X
American Airlines	X	X	X	X
ATA				
Boeing	X	X	X	X
British Airways	X	X	X	X
Continental Air Lines	X	X	X	X
Delta Air Lines	X	X	X	X
EASA		X	X	
FAA	X	X	X	X
Federal Express	X	X		X
Gulfstream		X	X	
Japan Air Lines	X	X	X	X
Lockheed			X	X
Northwest Airlines	X	X	X	X
SIE				
TIMCO				
United Airlines	X			
UPS	X	X		X
US Airways	X	X	X	X

4. AAWG Task Group Organizational Attendance

	MEETING NUMBER																
Organization	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Airborne Express		X		X		X								X		X	
Airbus	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
American Airlines	X		X	X	X	X	X		X	X	X	X	X	X	X		X
ATA																	
Boeing	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
British Airways	X	X	X	X	X		X	X	X	X	X	X	X	X	X		X
Continental Air Lines																	
Delta Air Lines	X	X															
EASA	X	X	X	X													
FAA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Federal Express	X	X	X	X		X	X	X	X	X	X	X	X	X		X	X
Gulfstream																	
Japan Air Lines	X	X		X				X					X				
Lockheed																	
Northwest Airlines	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SIE						X						X					
TIMCO																	
Transport Canada								X				X					
United Airlines																	
UPS	X	X	X	X	X	X	X	X	X						X		X
US Airways	X	X								X				X	X	X	

Federal Register

Wednesday,

February 2, 2005

Part II

Department of Transportation

Federal Aviation Administration

14 CFR Parts 119, 121, 129, 135, and 183

Aging Airplane Safety; Final Rule

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 119, 121, 129, 135, and 183

[Docket No. FAA–1999–5401; Amendment Nos. 119–6, 121–284, 129–34, 135–81, and 183–11]

RIN 2120–AE42

Aging Airplane Safety

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule; disposition of comments.

SUMMARY: This action adopts the interim final rule published on December 6, 2002, as a final rule with changes. The IFR imposed statutory requirements from the Aging Aircraft Safety Act of 1991 for certain airplanes to undergo inspections and records reviews after their 14th year in service and at specified intervals after that. Also, the rule imposed a requirement to include supplemental inspections by specified deadlines in the maintenance programs for these airplanes. With this action, the FAA responds to comments to the IFR, further clarifies parts of the rule language, and substantially revises the supplemental inspection requirements.

DATES: The interim final rule became effective December 8, 2003. This final rule becomes effective March 4, 2005.

FOR FURTHER INFORMATION CONTACT: Frederick Sobeck, Aircraft Maintenance Division, AFS–308, Flight Standards Service, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591; telephone (202) 267–7355; facsimile (202) 267–5115.

SUPPLEMENTARY INFORMATION:

Availability of Rulemaking Documents

You can get an electronic copy using the Internet by:

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

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

(3) Accessing the Government Printing Office's Web page at *http://www.gpoaccess.gov/fr/index.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 amendment number or docket number of this rulemaking.

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

Small Business Regulatory Enforcement Fairness Act

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

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 and Section 44717, Aging aircraft. Under section 44701 the Administrator is charged with prescribing "regulations and minimum standards in the interest of safety for inspecting, servicing, and overhauling aircraft, aircraft engines, propellers, and appliances." Under section 44717 the Administrator is charged with prescribing "regulations that ensure the continuing airworthiness of aging aircraft." In accordance with those regulations the Administrator must "make inspections, and review the maintenance and other records, of each aircraft an air carrier uses to provide air transportation that the Administrator decides may be necessary to enable the Administrator to decide whether the aircraft is in a safe condition and maintained properly for operation in air transportation." These inspections and reviews "shall be carried out as part of each heavy maintenance check of the aircraft conducted after the 14th year in which the aircraft has been in service."

This regulation is within the scope of section 44701 since it establishes requirements and minimum standards for the inspection of aging aircraft and establishes requirements for the inclusion of supplemental inspections in aircraft maintenance programs. Additionally, the regulation specifically responds to the statutory mandate prescribed in section 44717 by establishing a requirement for certain airplanes to undergo inspections and records reviews after their 14th year in service and at specified intervals thereafter.

Background

This final rule adopts the interim final rule (IFR) published at 67 FR 72726 on December 6, 2002, as a final rule with changes. The provisions of the IFR became effective on December 8, 2003. The rule resulted from requirements placed on the FAA by the Aging Aircraft Safety Act (AASA) of 1991. Section 402 of the AASA requires the Administrator to "initiate a rulemaking proceeding for the purpose of issuing a rule to assure the continuing airworthiness of aging aircraft."

Specifically, the AASA requires "the Administrator to make such inspections and conduct such reviews of maintenance and other records of each aircraft used by an air carrier to provide air transportation as may be necessary to determine that such is in a safe condition and is properly maintained for operation in air transportation." Further, the AASA states an air carrier must show, as part of the inspection, "that maintenance of the aircraft's structure, skin, and other age-sensitive parts and components have been adequate and timely enough to ensure the highest degree of safety." Title 14, Code of Federal Regulations (14 CFR) §§ 121.368, 129.33, 135.422, and 135.423 of the IFR cover the AASA's requirements for airplane inspections and records reviews.

Additionally, the FAA found it necessary to initiate a consistent approach to preserve the continued airworthiness of the airplane structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. Sections 121.370a, 129.16, and 135.168 of the IFR include supplemental inspection requirements that address the continued airworthiness of this type of airplane structure. These sections require operators to use damage-tolerance-based inspections and procedures to maintain the continued airworthiness of the affected airplane structure. However, certain operators of airplanes initially certificated with nine or fewer passenger seats and used in scheduled operations could use service-history-based inspections to meet these requirements. The damage-tolerance (DT) based inspections and procedures required in these sections are based on the same methodology identified in 14 CFR 25.571 (Damage-tolerance and fatigue evaluation of structure). This methodology has been used successfully to develop supplemental structural inspection programs (SSIP) and repair assessment guidelines (RAGs) for pressurized fuselages. Therefore, the FAA has determined that this methodology is an acceptable approach to maintaining the continued airworthiness of the affected airplane structure.

IFR Revised by Technical Amendment

The FAA published a technical amendment (68 FR 69307) on December 12, 2003, to the Aging Airplane Safety IFR. This amendment made minor technical changes to the IFR.

Aging Airplane Program Activities

The FAA's Aging Airplane Program came about to address airplanes operated beyond their original design service goals, the 1988 Aloha B–737 accident, and the Aging Aircraft Safety Act of 1991. When the program first started, the goal was to preserve the structural integrity of the aging airplane fleet by requiring structural modifications and inspections to address certain design deficiencies that could lead to airplane structural damage. Following the 1996 TWA 800 B–747 accident, the FAA expanded the Aging Airplane Program to include non-structural systems. The goal was to address requirements for design, inspection, repair, and maintenance of fuel tanks and electrical wiring on aging airplanes. Efforts related to Aging Airplane Program initiatives have resulted in the issuance of airworthiness directives (ADs) and rulemaking actions. Such actions include this Aging Airplane Safety rule, which addresses airplane structure.

The FAA's Review of the Aging Airplane Program

Because of issues raised by industry about the effectiveness and efficiency of the Aging Airplane Program, the FAA recently performed a comprehensive review of it. The goals of this review were to—

- Identify how to most effectively align rulemaking initiatives to ensure there are no overlapping or redundant requirements;
- Ensure that design approval holder data supporting operator compliance are available and timely; and,
- Ensure the resulting maintenance requirements allow operators to be more efficient in revising their maintenance programs when addressing multiple, similar initiatives.

The Aging Airplane Safety IFR was among the rules and proposals included in the FAA's aging program review. The FAA determined that better aligning certain compliance dates in existing rules and pending proposals and making certain substantive changes to them would increase their cost-effectiveness without compromising safety. As a result, the FAA has made changes to the Aging Airplane Safety IFR and has clarified parts of the rule language in the IFR. Also, the FAA has made changes to other aging program rules.

Additionally, the FAA tasked the Aviation Rulemaking Advisory Committee (ARAC) to develop damage tolerance (DT) guidelines to support compliance with §§ 121.370a and 129.16 of the Aging Airplane Safety rule in response to comments to the IFR (69 FR 26641, May 13, 2004). Further, based on comments to the IFR, the FAA is considering proposing a new rule to require type certificate and supplemental type certificate holders to develop DT programs that will support compliance with the Aging Airplane Safety final rule.

On July 30, 2004, the FAA published a final rule with request for comments entitled, Fuel Tank Safety Compliance Extension and Aging Airplane Program Update, (69 FR 45936). You may refer to that document for more details about the FAA's review of the Aging Airplane Program initiatives and the results of the review.

Changes to the IFR

Based on the FAA's recent review of the Aging Airplane Program and the comments to the Aging Airplane Safety IFR, we believe certain revisions and clarifications to the IFR are proper. These changes are intended to retain the rule's safety objective while reducing the burden on the industry. The major changes, which pertain to the supplemental inspections requirements in §§ 121.370a, 129.16, and 135.168 are listed below and are described in detail later in this preamble.

- Removal of certain DT-based supplemental inspection requirements for airplanes operated under parts 121 and 129.
- Extension of the compliance date and narrowing of the airplane applicability for the DT-based supplemental inspection requirements that remain in the final rule for airplanes operated under parts 121 and 129.
- Removal of the supplemental inspection requirements for part 135 airplanes.
- Clarification of the type of airplane structure the supplemental inspection requirements cover.

Discussion of Comments

The FAA sought and received comments to the interim final rule (IFR).

General Comments

Comment: Several commenters express concern the FAA did not seek recommendations from the ARAC to develop the IFR. The commenters ask the FAA to explain why the agency did not seek ARAC's advice. One commenter wants the FAA to refer the IFR to the ARAC for final review and completion so the rule could more easily be harmonized with foreign Civil Aviation Authorities' (CAAs) requirements.

FAA Response: This final rule is based on a congressional mandate imposed by the Aging Aircraft Safety Act (AASA) of 1991. Therefore, rather than seeking recommendations, the FAA used the terms of the AASA to develop the Aging Airplane Safety rule. However, based on requests from the Air Transport Association (ATA) and others from the industry, the FAA recently tasked ARAC (69 FR 26641, May 13, 2004) to develop guidelines that would support industry's compliance with §§ 121.370a and 129.16 of this final rule. Since Congress mandated the terms of the Aging Airplane Safety rule, the FAA believes it would not have been proper to refer the rule to ARAC, solely to harmonize it with foreign CAAs' actions.

Airplane Inspections and Records Reviews

Comment: A commenter suggests the FAA modify the recordkeeping requirements of the IFR.

FAA Response: The commenter did not provide specific recommendations about how to modify the recordkeeping requirements of the rule. However, as part of the FAA's review of the Aging Airplane Program, the FAA withdrew the Corrosion Prevention and Control Program (CPCP) proposed rule (69 FR 50350, August 16, 2004). Therefore, the FAA has amended the Aging Airplane Safety IFR to remove from §§ 121.368, 129.33, and 135.422, the requirement for operators to provide the current status of CPCPs as a separate item. Instead, they will provide this information as part of the requirement for the current inspection status of the airplane.

However, for those CPCPs mandated by airworthiness directive (AD), they will provide it as part of the requirement for the current status of ADs.

In addition, the FAA has removed the requirement from §§ 121.368, 129.33, and 135.422 of this final rule for operators to provide the current status of the inspections and procedures required under the supplemental inspection portion of the IFR. The FAA removed this requirement because under the terms of the final rule, operators must provide this information as part of the current inspection status of the airplane.

Comment: One commenter requests the FAA include a definition for ''age-sensitive parts'' in 14 CFR part 1.

FAA Response: For purposes of this rule, the FAA considers this term to mean those structural parts and components that are susceptible to fatigue cracking that could contribute to a catastrophic failure. Although the FAA has not defined age-sensitive parts in 14 CFR part 1, we will include this definition in the related advisory material.

Comment: One commenter requests the FAA amend the regulation to allow the use of Organizational Designated Airworthiness Representatives (ODAR) to perform the inspections and records review required by § 121.368. Several commenters address the use of Designated Airworthiness Representatives (DARs) to perform the required inspections and records reviews. The commenters are concerned with access to enough inspectors to perform the necessary inspections. One commenter states that to carry out the required inspections and records review, every air carrier will need at least two or three DARs. The commenter says this would require a greater commitment by the FAA to qualify many more DARs than they have in the past. Another commenter states they would need access to a DAR or Principal Maintenance Inspector (PMI) in the FAA's London, United Kingdom, office to inspect their aircraft and review their records. The commenter requests the FAA clarify whether data obtained from this review would be acceptable to the FAA when transferring an aircraft to the U.S. registry.

FAA Response: The FAA does not believe it is necessary to include specific language in the rule allowing the use of ODARs to perform inspections and records review. Each operator may decide, based on individual need, whether they will use designees or have the FAA perform the airplane inspections and records review this rule requires. The final rule does not mandate the use of DARs or ODARs. The Administrator already has the authority under § 183.33 (Designated Airworthiness Representative) to designate certain persons or organizations to perform these functions.

To aid the inspections by existing DARs, the FAA has updated the guidance material in FAA Order 8100.8B, Designee Management Handbook, and is providing workshops for its designees. The intent is to maximize the number of DARs available to conduct the inspections and records reviews. The FAA remains committed to the timely issuance of designee authorizations to properly qualified persons.

The comment about whether ''data'' obtained during airplane inspections and records review would be acceptable when transferring an aircraft to the U.S. registry is unclear. For part 129 operators, this final rule only applies to U.S.-registered airplanes. If the commenter transfers a non-U.S.-registered airplane to the U.S. registry, the airplane would have to meet all FAA operational and certification requirements on transfer, including the requirements of this final rule.

Comment: One commenter, who expresses concern for air safety, agrees the rule is needed and asks who would conduct the airplane inspections.

FAA Response: The FAA's airworthiness inspectors and designees will conduct the airplane inspections and records reviews required by this rule.

Comment: Two commenters discuss examining wire during airplane inspections and records reviews. One commenter says wiring is often overlooked in the inspection process. A second commenter says it is necessary to determine a timetable for wire and cable bundles to be inspected and replaced.

FAA Response: Congress passed the Aging Aircraft Safety Act of 1991 to address aging aircraft structural concerns resulting from the April 1988 accident involving a B–737. The Aging Airplane Safety rule, which resulted from the Act, addresses only structural concerns. The FAA is evaluating future rulemaking actions that may address other airplane systems such as wiring.

Comment: Some commenters say the rule is unnecessary. Several commenters believe the rule does not provide added safety benefits. One commenter says the FAA can achieve the same results without rulemaking by simply adding increased inspections to C and D checks. One commenter says the IFR duplicates existing regulations, is unevenly applied, and is inconvenient.

FAA Response: The Aging Aircraft Safety Act (AASA) of 1991, as codified in Section 44717 of Title 49 U.S.C., directs the Administrator to ''make inspections and review the maintenance and other records of each aircraft an air carrier uses to provide air transportation.'' The FAA issued this rule to comply with this statutory mandate. The rule helps ensure the continued structural airworthiness of airplanes that operate beyond their original design service goals. The inspection and records review requirements in this rule are not intended to increase the number of inspections the operator performs. The FAA will perform the airplane inspections and records reviews required by this rule during scheduled maintenance.

Comment: Some commenters express concern the term ''highest degree of safety'' is vague and is open to interpretation. One commenter says while this term appears in the Federal Aviation Act of 1958, it has never appeared in a rule until now. The commenter believes the FAA should interpret the Act rather than simply repeat the phrase in the rule.

FAA Response: The FAA's use of the term, ''highest degree of safety,'' in the Aging Airplane Safety rule is based on the statutory language contained in the AASA of 1991, subsequently codified as section 44717 of title 49 U.S.C. For purposes of this rule, the FAA considers that operators will have met the ''highest degree of safety'' by complying with their FAA-approved maintenance program.

The maintenance programs for those airplanes affected by the inspections and records review requirement of this rule may include certain elements of the FAA's Aging Airplane Program listed below:

- Supplemental Structural Inspection Programs.
- Corrosion Prevention and Control Programs.
- Structural Modification Programs.
- Repair Assessment Programs.
- Inspections and procedures identified in the Airworthiness Limitation section of the Instructions for Continued Airworthiness.
- Damage-tolerance-based inspections and procedures required by §§ 121.370a and 129.16 of this rule.

The first five elements have been incorporated into most large transport category airplane maintenance programs. There are some airplanes subject to the inspections and records reviews requirement that do not include some of these elements. Maintenance programs that include any of these elements will be subject to the airplane inspections and records review provisions of this rule.

According to the IFR, operators of certain model airplanes are not required to incorporate damage-tolerance-based inspections and procedures in their maintenance programs until December 5, 2007. This final rule extends this compliance date to December 20, 2010. As a result, damage-tolerance-based inspections and procedures, as required by §§ 121.370a and 129.16, are not required to be incorporated into maintenance programs before this date.

As explained later in this preamble under ''Changes to the Interim Final Rule'' heading, the FAA has removed the DT requirements for certain airplanes operated under parts 121, 129, and 135. However, the airplane inspections and records review requirement still applies to these airplanes.

Comment: One commenter states the requirements for the extent of inspections and records reviews are not clearly defined, which may lead to inconsistent interpretation and application.

FAA Response: The FAA intends to perform structural spot inspections of each airplane and review those records needed to determine compliance with §§ 121.368(d), 129.33(c), 135.422(d) of this final rule. The FAA has provided the following guidance to aid compliance with the airplane inspections and records reviews requirements in the rule:

- Notice 8300.113, Conducting Records Reviews and Aircraft Inspections Mandated by the Aging Aircraft Rules, dated November 25, 2003, which has been incorporated into FAA Order 8300.10, Airworthiness Inspector's Handbook. This guidance includes information on scheduling inspections and records review to minimize the impact on operators' maintenance schedules.
- Advisory Circular (AC 120–84) Aging Airplane Inspections and Records Reviews, provides guidance for operators to comply with the requirements of this rule.

The FAA believes providing guidance for our inspectors and for the industry will help reduce inconsistencies in interpreting and complying with the rule.

Comment: A commenter recommends the records review of ADs and modifications on structures that are not easily ''de-modified,'' such as Boeing 747 section 41, be waived after the first inspection. For repetitive inspections, the commenter suggests the review be required only on the records collected since the last inspection.

FAA Response: Under the airplane inspections and records review requirements, the FAA does not intend to inspect an airplane such that an operator would have to ''de-modify'' the structure to gain access to certain areas. These areas include ones modified by AD, supplemental type certificate (STC), FAA approved service bulletin, or FAA approved repair. However, if in complying with §§ 121.370a and 129.16 deficiencies are identified in a repair, alteration, or modification, or in the inspection procedures, removal of a previously modified structure may be required.

Comment: A commenter says the FAA's Flight Standards office has for many years conducted thorough records reviews and on-site spot inspections of airplanes during heavy maintenance visits. The commenter wants the FAA to allow credit for these prior records reviews and inspections either in the regulation or in the guidance material. The commenter says a certificate holder's PMI could be responsible for determining the extent of credit to give on a particular airplane.

FAA Response: Operators must provide the FAA with the current inspection status of the airplane as required by §§ 121.368(d), 129.33(c), and 135.422(d). To meet the requirement of these sections, the FAA intends to conduct the specified inspections and records review during scheduled maintenance visits. The FAA also intends to perform structural spot inspections of each airplane and review those records necessary to determine compliance with this rule. The FAA will consider the scope and timeframe of prior inspections to determine the extent to which those prior inspections can help the operator meet the inspections and records reviews mandated by this rule.

Comment: One commenter believes the requirement for a fixed repeat inspection interval not to exceed 7 years required by § 121.368(b) should be removed. Further, any subsequent inspection requirements should be met based on an agreement between the operator and the PMI. This would allow the operator and the PMI to agree on the schedule for follow-up inspections. The commenter says this is particularly true for those fleet types where the FAA-approved maintenance programs are segmented. Such programs do not provide for 14-day downtimes or only provide for 14-day downtimes at intervals beyond 7 years. Thus, the commenter recommends the following wording at the end of subparagraphs (1), (2), and (3) of § 121.368(b): ''* * * and thereafter at intervals approved by the FAA principal maintenance inspector (PMI) having cognizance for the operator.''

FAA Response: The FAA selected a 7-year interval for repeat inspections to provide time for operators to schedule the inspections and records review. Such scheduling would take place during a ''C'' check or segment thereof, ''D'' check or segment thereof, or other scheduled maintenance visits where structural inspections are done. The FAA believes a 7-year repeat interval provides scheduling flexibility for the operator to meet the requirements of the rule. Also, §§ 121.368(c), 129.33(b), and 135.422(c) of the rule authorize the Administrator to approve up to a 90-day extension beyond the 7-year interval required by §§ 121.368(b), 129.33(a), and 135.422(b). The FAA's PMI may approve this extension for the Administrator. The FAA agrees the operator and PMI should work together to agree on the specific time within the 7-year repeat intervals to conduct the required inspections and records review.

Comment: Several commenters express concern about the inspection intervals. One commenter states the repeat interval for inspections will result in maintenance program scheduling constraints. The commenter says meeting the 7-year requirement in the rule would result in 118 added heavy maintenance visits (HMV) because their HMVs on B–737 and B–767s are scheduled at 8-year intervals. In general, the commenter believes the timeframes for inspections and records reviews in the rule are out of sync with their particular maintenance program requirements. Another commenter states that certificate holders and FAA inspectors should work together to schedule the required inspections to coincide with existing inspection schedules. The commenter adds the FAA should quickly publish guidance that removes any doubt about the effect of the rule on heavy maintenance check (HMC) schedules.

FAA Response: The AASA states the records reviews and inspections will be carried out as part of the operator's HMC. To comply with the statute, the FAA considers an HMV or HMC to consist of a ''C'' check or segment thereof, a ''D'' check or segment thereof, or other scheduled maintenance where structural inspections are accomplished. The FAA agrees the required inspections and records review should coincide as much as possible with operators' existing maintenance schedules. The FAA does not believe the rule will result in added HMVs or HMCs since the FAA intends to coordinate the airplane inspections and records reviews to coincide with scheduled HMVs and HMCs. To provide guidance for the conduct of the inspections and records reviews, the FAA published Notice 8300.113 and AC 120–84, discussed earlier in this preamble.

Comments: A commenter suggests the FAA reduce the inspection intervals from 14 years to 8 years and conduct periodic spot checks of 20 percent of the airplanes during the inspection intervals.

FAA Response: The statute requires inspections and records reviews of each airplane to ''be carried out as part of each HMC of the aircraft conducted after the 14th year in which the aircraft has been in service.'' To meet this requirement, the FAA must inspect each airplane. However, the FAA intends to conduct a spot inspection of each airplane. The FAA established the first and repeat intervals at which inspections and records reviews will be done. The FAA set the first inspections based on the age of the airplane with the oldest airplanes being scheduled first. The repeat intervals for all airplanes, regardless of age, is set at 7 years, following completion of the first inspection.

Comment: One commenter believes § 121.368(d) should request a listing of operational limits as part of the airplane records. This commenter also says aging aircraft rules require full compliance with their terms on transfer of an aircraft. Therefore, a statement about full compliance on transfer should be included in the rule.

FAA Response: The FAA does not require a listing of ''operational limits'' as part of the airplane records required in § 121.368. However, the FAA does require that operators make available records that contain the current status of life-limited parts of the airframe.

The FAA has not included a requirement that an operator provide a statement that an airplane complies with the provisions of this rule at the time of transfer. Operators show compliance with the airplane and records availability requirements of the rule by making affected airplanes that meet the stated time in service and their associated records available to the Administrator within the prescribed interval. If the commenter transfers an airplane from a foreign country to the U.S. registry, the airplane will have to meet all FAA operational and certification requirements on transfer, including the requirements of this final rule.

Comments: Several commenters state § 121.368 duplicates current regulations, especially the provisions of § 121.380, which also relate to recordkeeping requirements. In support of their comments, they say most operators of large transport category airplanes have developed elaborate maintenance recordkeeping systems under § 121.380. They say these systems duplicate the requirements under § 121.368. They recommend the FAA revise the language in § 121.368(d) that states ''* * * together with records containing the following information'' to read ''* * * together with the following records or those specified in § 121.380.''

One commenter contends the FAA should modify the rule or add in the advisory circulars a statement saying compliance with § 121.380 is an alternate way to comply with § 121.368. This same commenter states § 121.380 is more comprehensive than § 121.368, especially about airworthiness directives. Existing § 121.380(a)(2)(vi) requires records to include ''* * * the current status of applicable airworthiness directives, including the date and methods of compliance, and, if the airworthiness directive involves recurring action, the time and date when the next action is required.'' However, for Airworthiness Directives, § 121.368(d)(8)(i) requires ''current status of the following, including the method of compliance.''

FAA Response: The FAA agrees that some of the recordkeeping requirements of § 121.368(d) are also found in § 121.380. However, § 121.368(d) contains added recordkeeping requirements not found in § 121.380. These added requirements allow the FAA to determine compliance with the Aging Airplane Safety rule. For example, § 121.368(d) requires records containing information on total years in service of the airplane and total flight cycles of the airframe. Because § 121.368(d) contains requirements not contained in § 121.380, compliance with § 121.380 by itself cannot constitute compliance with § 121.368(d). Operators can show compliance to both §§ 121.368(d) and 121.380 within a single recordkeeping system that is acceptable to the FAA. This removes the need to repeat recordkeeping for those requirements found in § 121.368(d) and § 121.380. The FAA included guidance in advisory circular AC 120–84, Aging Airplane Inspections and Records Reviews, to address the records requirements. The FAA also has included guidance in Notice 8300.113, Conducting Records Reviews and Aircraft Inspections Mandated by the Aging Aircraft Rules, which has recently been incorporated into FAA Order 8300.10 to address these requirements.

The FAA agrees that compliance with § 121.380(a)(2)(vi) should satisfy the recordkeeping requirements contained in § 121.368(d)(8). Therefore, we have revised § 121.368(d)(8) to match the requirements in § 121.380(a)(2)(vi).

Comments: A commenter says the provisions of § 119.59 already provide adequate authority to carry out aircraft inspections and records reviews required by § 121.368.

FAA Response: The FAA agrees. Section 119.59(a) states ''at any time or place, the Administrator may conduct an inspection or test to determine whether a certificate holder under this part is complying with Title 49 of the United States Code, applicable regulations, the certificate, or certificate holder's operations specifications.'' The Aging Aircraft Safety Act, however, requires the Administrator to conduct specific inspections that before the Act were part of the FAA's discretionary oversight.

Comments: One commenter notes some major repairs have no repetitive inspections associated with them and recommends the FAA amend § 121.368(d)(10) to read: ''A report of major repairs which require supplemental inspections, and the inspection status of those repairs.''

FAA Response: The FAA disagrees. Knowing the inspection status of all major repairs, including those repairs that have no damage-tolerance-based repetitive inspection requirement, is an important part of maintaining the continued airworthiness of aging airplanes. The inspection and records review required by § 121.368(d)(10) will help ensure major repairs and changes to major repairs are properly recorded and their inspection status verified. There are past instances where modification of major repairs degraded the airplane's structural integrity to the point of making it no longer airworthy. In some cases, it was determined the current inspections were not adequate to address the modifications. In other cases, where no inspections were required for the original modification, it was determined that repetitive inspections were necessary to ensure the airworthiness of the modified repair. Therefore, the value of the inspection and records review required by § 121.368(d)(10) is to verify the condition of all major repairs and identify areas where more inspections may be required.

Advisory Material and Training for Aging Airplane Inspections and Records Reviews

Comment: Several commenters express concern about whether enough training, guidance material, and trained inspectors would be available to support compliance with the rule. One commenter suggests if guidance materials and trained inspectors are not ready by December 8, 2003, the compliance date specified in § 121.368, the FAA should index the 48-month inspection and records review completion window based on the availability of trained inspectors. One commenter requests the FAA open DAR and PMI training programs to non-U.S. operators. Another commenter asks the FAA to extend this compliance date to the date the FAA completes training for FAA inspectors and DARs, unless the guidance material is issued with the final rule. One commenter says it is especially important to provide training and guidance material to operators during the initial period of compliance with this rule.

FAA Response: The FAA agrees that timeliness of training is important to meeting the deadlines in the rule. Therefore, the FAA completed workshops for its flight standards airworthiness inspectors and is providing workshops for its designees (DARs and ODARs). The intent of these workshops is to ensure that FAA airworthiness inspectors, DARs, and ODARs use uniform procedures when conducting their inspections and records reviews. A foreign air carrier may hire an FAA designee to perform the airplane inspections and records review required by the Aging Airplane Safety rule. The FAA does not intend to develop a training course specifically for air carriers. However, the FAA has developed an AC 120–84, Aging Airplane Inspections and Records Reviews, to help operators affected by the Aging Airplane Safety rule.

Additionally, the FAA published guidance in Notice 8300.113, Conducting Records Reviews and Aircraft Inspections Mandated by the Aging Aircraft Rules. The FAA's training preparations and published guidance allowed the FAA to begin inspections and records reviews shortly after the effective date of the IFR.

The FAA is adopting an approach that enables the existing FAA inspector workforce to comply with their obligations under this rule. The approach involves the use of spot inspections and records reviews and coordinating with operators to perform these inspections and reviews during scheduled maintenance.

Comment: A commenter requests clarification on the applicability of Handbook 8300.10, volume 3, chapter 2, to on-site inspections.

FAA Response: The FAA has reviewed volume 3, chapter 2 of FAA Order 8300.10, Airworthiness Inspector's Handbook, which discusses the conduct of structural spot inspections of an operator's aircraft, to determine the applicability of that chapter to the airplane inspections and records review requirements. The FAA found that this Order did not provide enough guidance to conduct inspections and record reviews required under the rule. Therefore, the FAA issued Notice 8300.113 on November 25, 2003, to provide added guidance to inspectors to conduct these inspections and records reviews.

Comment: Several commenters discuss draft AC 120–84, which was released concurrently with the IFR. In general, the commenters express concern that the AC provides no added guidance to operators. The commenters feel that operators are inadequately prepared for the inspections and reviews required under the IFR.

FAA Response: Based on comments received, the FAA has revised AC 120–84, Aging Airplane Inspections and Records Reviews, to be consistent with the final rule. The FAA has provided more guidance in the AC on conducting airplane inspections and records reviews. In addition, the FAA has changed Order 8300.10, Airworthiness Inspector's Handbook, to provide standardized guidance to FAA inspectors when conducting airplane inspections and records reviews.

Comment: A commenter requests the FAA clarify whether AC 120–84 is intended to address structural issues only.

FAA Response: AC 120–84 applies to airplane structures only.

Comment: A commenter notes that AC 120–84 contains an inaccurate reference to § 121.212, which does not exist.

FAA Response: The FAA agrees with the commenter and has made the correction in the final version of AC 120–84.

Supplemental Inspections

To aid understanding of the discussion about repairs, alterations, and modifications (RAMs), which appears below, the FAA offers the following explanation: The industry has used the terms ''alteration'' or ''modification'' synonymously to define a design change to an airplane. Therefore, the FAA uses both terms to avoid potential misinterpretation of the intent of these terms.

Comment: A commenter suggests the FAA withdraw the supplemental inspection requirement and task the ARAC to provide advice in this area. Another commenter suggests the FAA extend the compliance date to 2010 since the FAA issued the notice of proposed rulemaking in 1999.

FAA Response: The FAA determined that it is no longer necessary to impose the DT requirements of this rule on the number of airplanes mandated in the IFR. Therefore, this final rule only imposes DT requirements on airplanes that are—

- Transport category;
- Turbine powered;
- Have a type certificate issued after January 1, 1958; and
- Have, because of original type certification or later increase in capacity, a maximum type-certificated passenger seating capacity of 30 or more or a maximum payload capacity of 7500 pounds or more.

The FAA determined that damage-tolerance-based inspections and procedures are an effective way to meet the AASA's requirement for preserving the continued airworthiness of an airplane's structure. AC–25.571–1C, Damage Tolerance and Fatigue Evaluation of Structure, which the ARAC helped develop, is an acceptable means of compliance with the DT-based supplemental inspection requirements for the baseline structure (type design) of an airplane. The FAA tasked the ARAC on May 13, 2004, to develop guidelines to support the industry's compliance with the rule's requirements to address repairs, alterations, and modifications. Further, the FAA has extended the compliance date for operators to have damage-tolerance-based inspections and procedures in their airplane maintenance programs from December 5, 2007, to December 20, 2010. This extension should allow enough time for the ARAC to perform the tasking and for operators to comply with the supplemental inspection requirements of the final rule.

Comment: A commenter asks whether the FAA would extend the December 20, 2010, compliance date for those parts of the IFR that already contain this compliance date.

FAA Response: The FAA has removed from the rule the supplemental inspection requirements related to design-life goal airplanes, airworthiness directive-mandated service-history-based inspections, and multiengine airplanes with nine or fewer passenger seats. These requirements had a compliance date of December 20, 2010. However, as noted earlier, the FAA has removed all part 135 supplemental inspection requirements from this rule. Also, the FAA has extended the compliance date for the remaining supplemental inspection requirements under parts 121 and 129 from December 5, 2007, to December 20, 2010.

Comment: One commenter states for aircraft transferring from country to country, it is not clear how the life limits (design-life goal) would be interpreted.

FAA Response: As noted earlier, the FAA has removed the design life goal requirement from the rule.

Comment: One commenter states the FAA has not proven that a DT inspection program is any more effective than the current programs operators use for their small airplane fleets. The commenter suggests the FAA use another method for 10- to 19-seat, nontransport-category airplanes.

FAA Response: Based on industry comments and the FAA's reassessment of the IFR and the Aging Airplane Program, the FAA narrowed the scope of airplane applicability in §§ 121.370a and 129.16 to impose DT requirements on transport category, turbine powered airplanes with a type certificate issued after January 1, 1958, that as a result of original type certification or later increase in capacity, have—

- A maximum type-certificated passenger seating capacity of 30 or more; or
- A maximum payload capacity of 7,500 pounds or more.

As a result, the final rule does not apply to the airplanes the commenter references.

Comment: A commenter notes that currently DT and safe-life inspections are acceptable to show compliance with maintenance requirements. However, it appears that under the IFR, the FAA will only accept DT-based maintenance programs after December 2007. The commenter suggests the IFR clearly state that parts certified as safe-life are exempt from the requirements of § 121.370a. Another commenter notes that several aircraft, such as the EMB–110, were designed using safe-life criteria, which were required at the time of certification. The commenter states that aircraft not designed using DT techniques will not have accessibility to all areas that must be inspected under a Damage Tolerance Inspection Program (DTIP). The commenter suggests that forcing DT inspections could result in unintended damage to the structural integrity of the aircraft.

FAA Response: The intent of the Aging Airplane Safety rule is to apply the DT and fatigue evaluation of structure consistent with the evaluation prescribed in § 25.571. Section 25.571(c) includes provisions for the evaluation of safe-life structures when the applicant determines the DT requirements of § 25.571(b) are impractical for a particular structure. For purposes of this rule, damage-tolerance-based inspections and procedures will not be required for an airplane component certified as a safe-life design (*e.g.*, landing gear) and where the application of the DT requirements of § 25.571(b) are determined to be impractical.

Comment: Several commenters ask the FAA to clarify the extent to which a DT assessment for repairs, alterations, and modifications (RAMs) beyond the fuselage pressure boundary will be required. One of the commenters says the industry held 29 meetings over 7 years to develop a process and procedure to assess existing repairs. They found that a rational, technical basis is needed only to assess the DT of fuselage pressure boundary repairs. Also, the commenter states while the IFR indicates damage-tolerance-based maintenance programs must be in place by December 2007, the IFR does not say what this means. The commenter recommends two options regarding § 121.370a. In option 1, the commenter states the FAA should withdraw § 121.370a and the associated draft AC 91–56B (regarding airplanes >75,000 lbs maximum takeoff weight (MTOW)). Additionally, the commenter requests that the FAA task the Aviation Rulemaking Advisory Committee (ARAC) with formulating the technical considerations and the rule and advisory language for developing a damage tolerance-based maintenance program for the primary structure of the airplane. In option 2, the commenter notes the FAA should remove the DT assessment of primary structural elements (PSEs) for RAMs discussion from the preamble to the IFR and the associated draft AC 91–56B, when re-published, and task ARAC to develop appropriate direction for the FAA.

One commenter also notes that significant gaps appear in the DT guidance materials original equipment manufacturers (OEM) provide for DT-based inspections and procedures.

Another commenter states the rule, with respect to RAMs made to non-ATA 53 (fuselage structure) PSEs, should not apply to aircraft certificated before amendment 25–45. The commenter further states that they are unaware of any fleet evidence of DT problems associated with a repair to non-ATA 53 PSEs. The commenter supports the ARAC's Airworthiness Assurance Working Group's (AAWG) earlier recommendation on repair assessment that the scope of addressing repairs for DT on pre-amendment 25–45 aircraft should be confined to those repairs made only to the fuselage pressure boundary.

FAA Response: In 1992, the FAA and the AAWG surveyed large transport category airplane models to assess the status of repairs. In 1994, the AAWG requested manufacturers conduct a second survey on airplane repairs to validate the 1992 results. The surveys showed that the fuselage pressure boundary was the area most susceptible to structural damage and subsequent repairs. Therefore, in response to the AAWG's recommendations, the FAA issued the ''Repair Assessment for Pressurized Fuselages'' final rule (65 FR 24108, April 25, 2000).

In the preamble language to that rule, the FAA recognized, based on the AAWG's recommendations, that additional rulemaking may be needed to address repairs on the remaining primary structures. In addition, the preamble under the heading ''Determining which Airplanes Should be Affected,'' states:

> Those transport category airplanes that have been certificated to regulatory standards that include the requirements for damage-tolerance structure under § 25.571 are not included in this rulemaking action. These later requirements make it incumbent on the operating certificate holder to return the structure to the original certification basis by installing only those repairs that meet the airplane's damage-tolerance certification basis. The AAWG, in its final report on this subject, did recommend continued monitoring of repairs on newer airplanes, with the possibility of additional rulemaking if conditions warrant * * * It was from this activity that the AAWG and the manufacturers recognized not only the need for a RAG document for each affected model, but a SRM updated to include the results of a damage-tolerance assessment.

As transport category airplanes continue to accumulate flight hours, they are increasingly susceptible to fatigue cracking and repairs. The FAA has determined that there is no technical basis for excluding any repaired airplane structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. Therefore, the FAA believes that repairs made to such structure that is outside the pressure boundary must be addressed as part of this final rule.

In an effort to support industry's compliance with the Aging Airplane Safety final rule, the FAA tasked ARAC (69 FR 26641, May 13, 2004) to make recommendations regarding the assessment of repairs beyond the fuselage pressure boundary. We tasked ARAC to complete their work by December 18, 2009. In addition, the FAA recognizes that additional time is needed to implement the ARAC recommendations, which are related to guidelines for establishing DT-based inspections and procedures for RAMs, and for operators to incorporate DT-based inspections and procedures for RAMs into their maintenance programs. Therefore, the FAA has extended the DT-based supplemental inspection requirement compliance time in this final rule to December 20, 2010.

Comment: A commenter requests clarification on whether the FAA would accept a SSID program developed by the OEM as an alternate means of compliance with the supplemental inspection requirements.

FAA Response: The FAA will accept a SSID program for the baseline structure of an airplane developed by the OEM and approved by the FAA. If a SSID does not consider repairs, alterations, and modifications (RAMs), as required by this rule, the FAA would not accept it as a means to comply with this portion of the rule.

Comment: One commenter notes that the IFR will apply to pre- and post-amendment 25–45 airplanes; however, the accompanying guidance materials do not provide guidance for post-amendment 25–45 airplanes. Another commenter says the FAA should apply the December 2007 compliance date only to DTIPs for those areas where guidance materials have been developed.

FAA Response: The FAA believes adequate guidance exists for developing DT-based supplemental structural inspections for post-amendment 25–45 airplanes. The FAA recognizes that the guidance material for developing DT-based supplemental inspection programs that address repairs, alterations, and modifications may be inadequate to support compliance with this rule. Therefore, the FAA has tasked the ARAC to draft an advisory circular that contains guidance to support operators' compliance with §§ 121.370a and 129.16 for all affected airplanes. This guidance will support compliance with the final rule for the DT-assessment of repairs, alterations, and modifications made to aircraft structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure.

The FAA also has decided to extend the compliance date for the DT-based supplemental inspection requirement from December 5, 2007 to December 20, 2010. This will allow the ARAC enough time to develop the guidance material and will give the operators enough time to incorporate the DT requirements into their maintenance programs.

Comment: One commenter states that because ''DTIP'' is not concisely defined, the FAA should include a definition of this term in 14 CFR part 1. A second commenter expresses concern over the FAA's failure to clearly define ''DTIP.''

FAA Response: The term ''damage-tolerance-based inspections and procedures'' or DTIP as used in this rule refers to the actions needed to achieve damage tolerance as defined in AC 25.571–1C, Damage Tolerance and Fatigue Evaluation of Structure.

Comment: Several commenters express concern that operators will not be able to comply with the supplemental inspection requirements in the rule without data from the OEM. One commenter notes the IFR does not require OEMs to provide these data. This commenter suggests the FAA Transport Airplane Directorate standardize SSID ADs to aid industry compliance with DT-based inspections. Another commenter states they would not be able to comply with the rule because the manufacturer has not issued FAA-approved SSIDs for their airplane fleets.

FAA Response: The FAA is considering proposing a new rule to require type certificate and supplemental type certificate holders to develop damage tolerance inspection programs that will support compliance with the Aging Airplane Safety final rule. The FAA recognizes the need to standardize SSID ADs to aid industry's compliance with DT-based inspections and procedures.

Comment: One commenter notes that although the FAA has acknowledged difficulty in implementing ADs for structural repair manuals, the FAA does not present a solution to this problem in the IFR.

FAA Response: It is not the FAA's intent to mandate structural repair manuals by issuing ADs. While the commenter's specific concern is unclear, the FAA notes that we issue ADs to address known unsafe conditions on aircraft. OEM produced structural repair manuals are a part of the Instructions for Continued Airworthiness, and are used in carrying out operators' maintenance programs.

Comment: A number of commenters express concern about the design-life goals contained in Appendix N to part 121, Appendix B to part 129, and Appendix G to part 135 of the IFR. The commenters say the FAA may have used inconsistent approaches for determining design-life goals and evaluating specific aircraft types.

FAA Response: The FAA acknowledges the concerns the commenters express. The FAA has removed the design-life goal requirements, which include part 121 Appendix N, part 129 Appendix B, and part 135 Appendix G, from the regulation. The design-life goals were intended as a transition measure for those models listed in the appendices. The IFR required inspection programs to be in place by December 5, 2007 for airplanes above their design-life goals. For those airplanes that had not reached their design-life goal, inspection programs were not required until December 20, 2010. Since the compliance date for the damage tolerance requirements has been extended to December 20, 2010, this transition period is no longer needed. Additionally, only three of the models listed in the appendices meet the new airplane applicability requirement of this final rule, and these three models are no longer operated under part 121.

Comment: One commenter states that under existing ADs and repair assessment guidelines for pressurized fuselages, the required repair assessments are linked to the number of flight cycles as a percentage of the design-life goal. The commenter recommends that for airplanes that have more than 14 years in service but relatively few flight cycles, the FAA should not require DT assessment of all repairs during the initial aging aircraft inspections.

FAA Response: The FAA recognizes that current repair assessment guidelines for pressurized fuselages required by § 121.370 are linked to the number of flight cycles as a percentage of the design-life goal. The FAA has tasked ARAC to develop guidelines that would support the industry's compliance with § 121.370a for repairs, alterations, and modifications made to the baseline primary structure. The FAA expects the new repair assessment guidelines will be consistent with those developed for § 121.370. Also, the FAA has extended the compliance date for damage-tolerance-based inspections and procedures to December 20, 2010. This will give the ARAC enough time to complete its work.

Comment: One commenter recommends the term ''primary structure'' be replaced with the term ''Principle Structural Elements.''

FAA Response: The FAA disagrees the term ''primary structure'' should be replaced with the term ''Principle Structural Elements.'' This is mainly because of the different industry interpretations for the term ''Principle Structural Elements.'' However, the FAA believes it would be helpful to clarify the intent of this rule regarding the type of primary structure that requires damage-tolerance-based inspections and procedures. Therefore, the FAA provided this clarification in §§ 121.370a and 129.16 of this rule. The revised language applies to ''airplane structure susceptible to fatigue cracking that could contribute to a catastrophic failure.''

Advisory Material for Supplemental Inspections

Comment: Many commenters address the need for the FAA to provide more guidance material to assist operators in complying with the required DT-based inspections and procedures.

FAA Response: Guidance material is available in AC 25.571C for developing DT-based inspections for an airplane's baseline primary structure. As noted earlier, the FAA has tasked the ARAC to develop guidance material the operators can use to support their compliance with §§ 121.370a and 129.16 of this rule with respect to addressing repairs, alterations, and modifications.

Comment: One commenter says draft AC 91–56, Continued Structural Integrity Program for Airplanes, states that widespread fatigue damage (WFD) will be the subject of a separate rulemaking. However, little detail is given about how service bulletin reviews and aging aircraft programs should be carried out. The commenter recommends the FAA include in AC 91–56 the text the European Aging Aircraft Working Group (EAAWG) presented to cover these points. Another commenter questions whether the statement ''cracks must be difficult to detect during regular maintenance'' shows that WFD should be evaluated. If so, the commenter suggests the FAA clarify in the AC the effects of such an evaluation in extending design-life goals.

FAA Response: This rule does not include requirements for evaluating WFD. However, the FAA is considering future rulemaking that would address this topic. As a part of their tasking, the ARAC will review and make recommendations to the FAA on AC 91–56. Since the EAAWG is represented on the ARAC working group that is conducting the review, the FAA expects the views of the EAAWG would be considered.

Comment: A commenter suggests the FAA include a sample DT-assessment report in AC 91–56.

FAA Response: The commenter does not indicate how a DT-assessment report would be used and does not provide enough information about the scope of such a report. Without this information, the FAA is unable to consider including a sample report in AC–91–56.

Comment: One commenter questions whether the FAA will assign extended design-life goals to aircraft with SSIDs.

FAA Response: The FAA has removed the design-life goal requirements from the final rule. Therefore, aircraft with SSIDs will not be subject to design-life goal requirements.

Comment: A commenter recommends the FAA include in the AC not only those RAMs produced by type certificate (TC) holders, but also RAMs produced by non-TC holders through alternate means.

FAA Response: The FAA has tasked the ARAC to assess the effectiveness of AC–91–56B to provide guidance to supplemental type certificate (STC) holders for developing damage-tolerance-based inspections and procedures for repairs, alterations, and modifications made to airplane structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The ARAC will provide recommendations regarding the development of guidance for addressing RAMs.

Comment: A commenter notes that AC 91–60, The Continued Airworthiness of Older Airplanes, is being used to guide operators in scheduled operations. The commenter recommends the FAA edit the list of components in AC 91–60 to consider them for inclusion in inspection programs and express them in more general terms.

FAA Response: AC 91–60 addresses service-history-based inspections, which are typically applied to airplanes operated under part 135. As mentioned in the FAA's response to prior comments, the FAA has changed the airplane applicability in this final rule. Because of this change, the requirement in § 135.168 related to service-history-based inspections and procedures has been removed from the rule. However, the FAA intends to issue a revised version of the related AC, AC 91–60, Continued Airworthiness of Older Airplanes, as guidance for part 135 operators, who may still want to develop service-history-based inspections.

Comment: A commenter notes the preamble to the IFR states that certain DT-based supplemental structural inspection programs (SSIPs) do not fully meet the requirements of the IFR, which apply to the complete primary structure. The commenter suggests the final rule or its accompanying ACs state that inspections and procedures in the Airworthiness Limitation section of the Instructions for Continued Airworthiness and the supplemental structural inspection document (SSID) satisfy the IFR for baseline structure.

FAA Response: With respect to an airplane's baseline structure, FAA-approved DT-based supplemental structural inspection programs that address airplane baseline structure susceptible to fatigue cracking that could contribute to a catastrophic failure are considered an acceptable means of compliance with this rule. With respect to repaired, altered, or modified baseline structure, the FAA has tasked ARAC to develop guidelines that would support the industry's compliance with §§ 121.370a and 129.16 of the rule.

Comment: A commenter requests the FAA address how operators should communicate to the FAA that a Designated Engineering Representative (DER) approved repair is DT-based, when DT requirements were not part of the original certification requirements.

FAA Response: Operators inform the FAA that a DER approved repair is DT based by establishing DT-based inspections according to the requirements of § 25.571 at amendment 25–45 or later.

Economic or Cost Comments

Comment: One commenter states that operators of aircraft with 19 or fewer seats will pay the greatest cost, on a seat-by-seat basis, for complying with the IFR. The commenter notes that unlike the aircraft involved in the Aloha Airlines, Inc. accident, aircraft with 19 or fewer seats are unpressurized. The commenter requests the FAA provide an alternative to the DT maintenance program for non-transport category airplanes with 19 or fewer seats operated under part 121.

Another commenter states the IFR will impose an enormous burden on turboprop aircraft operators, many of which will not be able to afford to support a DTIP. There are, for example, a relatively small number of EMB–110s being used in scheduled passenger operations, meaning that the very large development costs for a DTIP would be distributed over a few operators. The commenter suggests this will result in the premature retirement by 2007 of a significant number of aircraft still within their safe-life design-service goal.

FAA Response: In consideration of comments to the IFR and the FAA's review of the Aging Airplane Program, the FAA has narrowed the scope of the airplane applicability in §§ 121.370a and 129.16. The new applicability for DT inspections and procedures covers airplanes that meet all the following requirements:

- Transport category.
- Turbine powered.
- Type certificate issued after January 1, 1958.
- As a result of original type certification or later increase in capacity, have a maximum type-certificated passenger seating capacity of 30 or more, or a maximum payload capacity of 7500 pounds or more.

Comment: Several commenters state the IFR will cause them an undue burden. One commenter states the financial impact of the IFR will far exceed the FAA's estimates because these estimates have grown since 1999, the year the NPRM was-issued. Another commenter says it conducted a survey of its members to estimate the compliance costs of the IFR. Based on its cost estimates for inspections, airplane and records availability, and establishing DT programs, this commenter estimates the cost of the IFR on the industry over the next 20 years will be between $1.3 billion and $2.7 billion. Another commenter notes the IFR will cost them an additional $363 million per year in rescheduling and $285,790,000 in lost revenue.

FAA Response: Following industry comments about the IFR cost estimates, the FAA reassessed the Aging Airplane Safety Program, and the FAA modified the IFR's existing requirements. These changes to the existing requirements of the IFR have the economic impact of reducing costs. The FAA estimates the changes to this rule will provide substantial cost savings to operators of 10-to 29-seat airplanes. The estimated cost savings depend on the number of affected airplanes remaining in scheduled passenger carrying operations as of December 20, 2010. Cost savings will decrease as the number of affected airplanes decrease. The final rule provides cost relief and imposes no added costs.

Comment: A commenter states that it will be costly for operators to perform the required inspections and records reviews. The commenter recommends that an operator's DARs perform the inspections and records review required by the IFR because DARs are more familiar with the aircraft. The commenter suggests the FAA's role should be to evaluate the DARs rather than conduct the inspections and records reviews.

FAA Response: This rule does not restrict operators from using DARs or ODARs to perform the required airplane inspections and records reviews.

Comment: A commenter states that requiring HMCs every 7 years has a potential cost to its members of more than $500 million. The commenter suggests the FAA align the IFR with existing air carrier maintenance schedules to mitigate these costs.

FAA Response: The FAA intends to perform the required airplane inspections and records reviews within the operator's normal maintenance cycle. Therefore, the FAA will perform these inspections and records reviews at a ''C'' check or segment thereof, a ''D'' check or segment thereof, or other scheduled maintenance visits where structural inspections are accomplished.

Comment: Several commenters address how the FAA might reduce the implementation costs of the IFR. One commenter states that the best way to reduce implementation costs is to train field inspectors comprehensively and emphasize the importance of integrating the IFR's requirements into current air carrier maintenance and inspection programs.

FAA Response: The FAA agrees that having an adequately trained inspector and designee workforce is important to providing a standardized approach to conducting the required airplane inspections and records reviews. Therefore, the FAA completed workshops for its flight standards airworthiness inspectors and is providing workshops for its designees (DARs and ODARs). The intent of these workshops is to ensure that FAA airworthiness inspectors, DARs, and ODARs use uniform procedures when conducting their inspections and records reviews. The FAA also has changed related guidance material to ensure uniformity in the inspection and records review process.

Comment: One commenter, who conducts operations under part 135, states the FAA should use Government funds to subsidize, at least in part, the cost of the inspections to minimize the impact on ticket prices.

FAA Response: As discussed earlier, the FAA made many changes to the IFR, which are cost relieving, particularly to persons conducting operations under part 135. For example, the FAA has removed the supplemental inspection requirement in the IFR for part 135 operators.

Comment: A commenter suggests that lessors will require non-U.S. operators to meet the part 121 requirements and non-U.S. operators will attempt to mitigate the costs, leading to a greater proportion of aircraft being owned by operators rather than being leased. The commenter contends that this may cause operators to elect to operate aircraft manufactured outside the United States, which are less likely to have the IFR requirements imposed within the lease agreements.

FAA Response: The FAA notes that the provisions of this rule apply to any affected airplane, regardless of its State of design or State of manufacture. The FAA notes that any affected U.S.-registered airplane will be subject to the requirements of this rule whether it is purchased from a seller in a U.S. location or from a seller in a foreign location. The FAA does not believe the requirements of this rule will influence an operator to elect to lease a foreign manufactured airplane in lieu of a U.S.-manufactured airplane.

Comment: A commenter, who conducts operations in Alaska, says that current regulations already provide for adequate safety for aircraft operated under part 121 and additional regulations will have no measurable increase on safety.

FAA Response: The FAA notes the proposal would not apply to airplanes engaged in operations solely within the State of Alaska. This rule responds to a congressional mandate set forth in the Aging Aircraft Safety Act of 1991. If the airplane is operated outside the State of Alaska, it would be subject to the provisions of this rule.

International Trade

Comment: One commenter states the FAA did not consider the impact of the IFR outside the U.S. market.

FAA Response: The FAA notes that this rule only applies to U.S.-registered airplanes. The rule does not apply to non-U.S.-registered airplanes used by foreign air carriers to conduct operations under part 129.

Changes to the Interim Final Rule

After the FAA's recent review of the Aging Airplane Program and comments to the Aging Airplane Safety interim final rule (IFR), the FAA found it necessary to make changes to the IFR. The IFR became effective on December 8, 2003. A discussion of the changes to the rule follows.

Sections 121.368 and 129.33 Aging Airplane Inspections and Records Reviews

These sections describe the requirements for operators to make certain airplanes available to the Administrator for inspection and records review. They also explain the type and content of records operators must make available for review. Current §§ 121.368(d) and 129.33(c) explain the content of the records operators must make available for review. The FAA made the following changes to these sections:

- In §§ 121.368(d)(2) and 129.33(c)(2), ''total flight hours of the airframe'' has been changed to ''total time in service of the airframe.'' The FAA's use of the term ''total flight hours'' was not intended to differ from the meaning of the term ''total time in service'' as defined in 14 CFR 1.1. The FAA made this change to avoid any inconsistencies in the interpretation of this rule and to remain consistent with existing recordkeeping requirements.
- Sections 121.368(d)(8) and 129.33(c)(8) of the IFR require the current status of inspections and procedures required by §§ 121.370a and 129.16, airworthiness directives, and corrosion prevention and control programs. As pointed out earlier in this preamble, as part of the FAA's review of the Aging Airplane Program, the FAA withdrew the Corrosion Prevention and Control Program (CPCP) proposed rule (69 FR 50350, August 16, 2004). Therefore, the Aging Airplane Safety IFR is being amended to remove from §§ 121.368 and 129.33, the requirement for operators to provide the current status of CPCPs as a separate item. Instead, operators will provide this information as part of the requirement for the current inspection status of the airplane, or for those CPCPs mandated by AD, they will provide it as part of the requirement for the current status of ADs. In addition, the FAA has removed the requirement from §§ 121.368 and 129.33 for operators to provide the current status of the inspections and procedures that are required under the supplemental inspection portions of the IFR. The FAA removed this requirement because under the terms of this final rule, operators must provide this information as part of the current inspection status of the airplane. Further, a commenter to the rule pointed out that § 121.380(a)(2)(vi) should satisfy the recordkeeping requirements in § 121.368(d)(8) related to ADs. The FAA agrees and has revised §§ 121.368(d)(8) and 129.33(c)(8) to match § 121.380(a)(2)(vi).

Sections 135.422 and 135.423 Aging Airplane Inspections and Records Reviews for Multiengine Airplanes

On December 20, 1995, the FAA published the Commuter Operations and General Certification and Operation Requirements rule (60 FR 65832). Because of this rule, airplanes certificated with 10 or more passenger seats may not conduct scheduled passenger carrying operations under part 135. Therefore, airplanes engaged in these operations are now subject to the aging airplane inspections and records review requirements contained in § 121.368 of this final rule. As a result, the requirements in § 135.422 of the IFR, which addresses these airplanes, are no longer needed.

The FAA notes that § 121.368 requires operators to provide records containing total flight cycles of the airframe. The FAA recognizes that some part 135 operators may not have kept a record of the total flight cycles of the airframe. Therefore, current flight cycle information may not be available. In such an instance, the operator should determine flight cycles using a flight hour to flight cycle ratio included in their manual that is acceptable to the assigned PMI.

In this final rule, the FAA has redesignated § 135.424 as § 135.423 and has made the following changes to § 135.422:

- The reference to ''total flight hours of the airframe'' is changed in to ''total time in service.'' This change is similar to the change in §§ 121.368(d)(2) and 129.33(c)(2) described earlier.
- The requirements to provide the current status of Corrosion Prevention and Control Programs (CPCP) and the current status of supplemental inspections and procedures required by § 135.168 are removed. These changes are similar to those made in §§ 121.368 and 129.33.
- The requirement to provide the time and date of the next recurring action for an airworthiness directive was added to paragraph (d)(7). These changes are similar to those made in §§ 121.368 and 129.33. In addition, the requirements in § 135.168 have been removed from the rule.

Sections 121.370a, 129.16, and 135.168 Supplemental Inspections

Airplane applicability: This final rule narrows the airplane applicability for supplemental inspections and procedures (DT-based and service-history-based). The final rule removes requirements for service-history-based inspections and procedures and imposes damage tolerance requirements on transport category, turbine powered airplanes with a type certificate issued after January 1, 1958, that as a result of original type certification or later increase in capacity, have—

- A maximum type-certificated passenger seating capacity of 30 or more; or
- A maximum payload capacity of 7,500 pounds or more.

The FAA determined that this rule should apply to airplanes with a type certificate issued after January 1, 1958, because this date is generally accepted as the beginning of the jet age for commercial aviation in the United States. It corresponds with the type certificate applicability date used in other rules, such as the Fuel Tank Design Review (SFAR 88) rule.

The reference to the original type certificate or later increase in capacity is intended to address two situations:

1. In the past, some designers and operators have attempted to avoid the application of requirements that apply only to airplanes over specified capacities by obtaining a design change approval for a slightly lower capacity. By including the reference to ''capacity resulting from the original certification,'' the FAA intends to remove this possible means of avoiding compliance.
2. It is also possible for an airplane design to be originally certified with a capacity slightly lower than the minimum specified in this section. But, through later design changes, the capacity could be increased above this minimum. The reference to ''later increases in capacity'' is intended to ensure that, if this occurs, the design would have to meet the requirements of this section.

The FAA received comments to the IFR that expressed concern about the economic burden the supplemental inspection requirement would place on persons operating small commuter airplanes in air-carrier service. These operators typically operate small fleets of airplanes with a passenger seating capacity of 30 or less. As of 2003, the U.S. fleet total of these airplanes consisted of 19 models and about 350 airplanes. This small number of airplanes per model makes it costly for operators to develop inspection programs. The FAA found that as of 2002, only about 50 percent of the small commuter fleet in use in 1997 was still operating in the U.S. By 2010, the FAA expects this percentage to decrease to only 11 percent (about 80 aircraft) or less of the commuter fleet in use in 1997. The FAA has determined the supplemental inspections for these airplanes are no longer needed and intends to address the discovery of any age-related problems for these airplanes through continued operational safety programs and ADs.

If operators of these small airplanes choose to voluntarily develop supplemental inspection programs, they can refer to AC 91–60, The Continued Airworthiness of Older Airplanes, which the FAA is currently revising, for guidance.

Compliance date: The current regulation contains a compliance date of December 5, 2007, for operators to include damage-tolerance-based inspections and procedures in their maintenance programs. In §§ 121.370a(c) and 129.16(b) of this final rule, the FAA has extended this compliance date to December 20, 2010.

On May 13, 2004, the FAA tasked ARAC to develop guidelines to support the industry's compliance with the rule's requirement to address repairs, alterations, and modifications. Extending the compliance date to December 20, 2010, will give ARAC time to develop these guidelines. It also will allow operators enough time to comply with the requirement to incorporate damage-tolerance-based inspections and procedures into their maintenance programs.

New model added through type certificate amendment (parts 121 and 129): The FAA has determined that this requirement is no longer needed. The intent of this requirement under §§ 121.370a(b) and 129.16(c) of the IFR was to cover certain large transport category airplanes (*e.g.*, B–737s, MD–80s, and A300s) whose certification basis does not include a requirement for damage-tolerance-based inspections and procedures. Since the FAA expects that some of these airplanes may reach or exceed their design-life goals before the extended compliance date for supplemental inspections, the FAA finds it necessary to mandate supplemental inspections and procedures (*i.e.*, supplemental structural inspection documents (SSIDs)) for these airplanes by issuing ADs. Operators of airplanes that will not reach their design-life goal by December 20, 2010, must comply with the supplemental inspection requirements (§§ 121.370a(c) and 129.16(b)) of this final rule by the December 20, 2010, date.

Design-life goal airplanes (parts 121 and 129): Under §§ 121.370a(c) and 129.16(d) of the IFR, the design-life-goal requirement restricts an operator from operating an airplane with a design-life goal listed in part 121 Appendix N and part 129 Appendix B, after December 5, 2007. This requirement is no longer needed because most of these airplanes have a passenger seating capacity of less than 30 passenger seats. Also, the FAA has extended the compliance date for supplemental inspections to December 20, 2010. The FAA expects that most of these airplanes will not be in scheduled passenger service by December 20, 2010. The FAA will address any age-related problems for these remaining airplanes through continued operational safety programs and ADs.

Airworthiness directive-mandated service-history-based inspections (parts 121 and 129): This requirement under §§ 121.370a(d) and 129.16(e) of the IFR prohibits an operator from operating an airplane beyond December 20, 2010, for which an airworthiness directive requires the maintenance program to include service-history-based inspections and procedures. The IFR further requires that after this date, the operator's maintenance program must include DT-based inspections and procedures for these airplanes. The airplanes subject to this requirement are mostly reciprocating engine powered airplanes that have long been out of scheduled passenger service. There are about 50 of these airplanes, consisting of four models, currently serving as freighters. Some of these airplanes are operating in the State of Alaska and are excepted from the requirements in this rule. The FAA has determined that imposing damage-tolerance-based inspections and procedures on the airplanes not operating in Alaska would impose an undue economic burden with little increase in safety benefits. The withdrawal of this requirement does not relieve the operators of these airplanes from any of the requirements in applicable ADs.

Supplemental inspections (part 135): Since the FAA has narrowed the applicability for supplemental inspections to certain transport category airplanes, § 135.168 and Appendix G to part 135 have been removed from this final rule.

Airplane structure applicability: Some comments to the IFR indicated the rule is still unclear about the type of airplane structure to which the DT-based inspections and procedures should be applied. Therefore, the FAA further clarified §§ 121.370a(c)(1) and 129.16(b)(1) of this final rule to state operators must include in their maintenance programs ''FAA-approved damage-tolerance-based inspections and procedures for airplane structure susceptible to fatigue cracking that could contribute to a catastrophic failure. These inspections and procedures must take into account the adverse affects repairs, alterations, and modifications may have on fatigue cracking and the inspection of this airplane structure.''

Approvals (§§ 121.370a(e) and 129.16(f)): The FAA has removed these approval paragraphs and has placed the approval requirements in §§ 121.370a(c)(2) and 129.16(b)(2) of the final rule. The FAA has modified the related rule language to further clarify and identify the approval levels the rule requires. The final rule states the damage-tolerance-based inspections and procedures and any revisions to them must be approved by the Aircraft Certification Office or the office of the Transport Airplane Directorate with oversight responsibility for the relevant type certificate or supplemental type certificate, as determined by the Administrator. The FAA intends to develop guidance material to provide a consistent approach to the approval process.

The rule also states operators must include the damage-tolerance-based inspections and procedures in their FAA-approved maintenance program.

Section 135.411 Applicability

The part 135 airplane inspections and records review requirements in the final rule, which applies to multiengine airplanes certificated for nine or fewer passenger seats, are now under § 135.422. In addition, the FAA has removed the requirements under § 135.423 and has redesignated § 135.423 as § 135.424. As a result, the FAA had to amend § 135.411(a)(1), which lists the part 135 aircraft maintenance requirements sections for aircraft with nine or fewer passenger seats. Additionally, we had to amend § 135.411(a)(2), which lists the part 135 aircraft maintenance requirements sections for aircraft with 10 or more passenger seats. In § 135.411(a)(1), we removed the reference to § 135.423 and added a reference to § 135.422. In § 135.411(a)(2), we removed the reference to § 135.422.

Cost Benefit Analysis

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 Act requires agencies to consider international standards and, where appropriate, that they be the basis for 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 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 not have a significant economic impact on a substantial number of small entities; (3) will not create obstacles to international trade; and does not impose an unfunded mandate on state, local, or tribal governments, or on the private sector.

This regulatory evaluation assesses the economic impacts of the changes to the IFR. Following the FAA's review of industry comments and the FAA's reassessment of the Aging Airplane Safety Program, the FAA modified the requirements of the IFR. These changes to existing requirements have the economic impact of reducing costs. As the economic impact of the changes to the IFR is cost relieving, the rule does not warrant a full regulatory evaluation. The FAA provides the basis for this minimal impact determination below.

Under the terms of the final rule, the FAA will conduct spot inspections and records reviews of affected airplanes operating under parts 121, 129, and 135. These inspections and records reviews are based on the requirements in the Aging Airplane Safety Act (AASA), which requires the Administrator to conduct inspections and records reviews of aging aircraft. The FAA intends to conduct these activities during scheduled maintenance to minimize the cost to industry.

This final rule reduces compliance costs by narrowing the scope of airplane applicability for the supplemental inspections portion (§§ 121.370a, 129.16, 135.168) of the IFR. This final rule requires damage-tolerance-based inspections and procedures (supplemental inspections) for transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958, and that, as a result of original type certification or later increase in capacity, have a maximum type-certificated passenger seating capacity of 30 or more, or a maximum payload capacity of 7,500 pounds or more.

As a result of narrowing the airplane applicability, the part 135 requirement and certain parts 121 and 129 requirements for supplemental inspections have been removed in the final rule. It would be costly for operators to develop inspection programs for the remaining small number of affected airplanes. The FAA found that as of 2002, about 50 percent of the small commuter fleet in use in 1997 was still operating in the U.S. By 2010, the FAA expects this percentage to decrease to only 11 percent (about 80 airplanes) or less. Therefore, the FAA has determined that the supplemental inspections for these airplanes are no longer needed. The FAA intends to address the discovery of any age-related problems for these airplanes through continued operational safety programs and ADs.

The FAA is removing the design-life goal requirements, which include part 121 Appendix N, part 129 Appendix B, and part 135 Appendix G, from the regulation. The IFR required supplemental inspection programs to be in place by December 5, 2007, for airplanes that exceeded their design-life goals. For those airplanes that had not reached their design-life goal, these inspection programs were not required until December 20, 2010. Since the compliance date for the damage tolerance requirements has been extended to December 20, 2010, this transition period is no longer needed.

The FAA has extended the compliance date from December 5, 2007 to December 20, 2010, for parts 121 and 129 operators to meet the DT-based supplemental inspection requirement. This extension will provide operators additional time to develop to incorporate DT-based inspection and procedures into their maintenance program. The FAA believes this extension is necessary to provide industry enough time to develop the DT-based inspections and for operators to incorporate these inspections and procedures into their maintenance programs. The extension will also allow ample time to train inspectors.

The FAA estimates this final rule will provide substantial cost savings to operators of multi-engine airplanes with less than 30 seats. Additionally, this final rule will provide cost savings by extending the supplemental inspections compliance date from 2007 to 2010 for all affected operators. The final rule provides cost relief and imposes no added costs. The benefits to this rule are the cost relief provided by extending the damage tolerance compliance time and narrowing the airplane applicability for DT-based inspections and procedures. Therefore, the FAA has determined the benefits of this regulatory action justify the costs.

Regulatory Flexibility Analysis

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.'' Under that principle, the Act requires agencies to solicit and consider flexible regulatory proposals, and to consider the rationale for their actions. The Act covers a wide range of small entities, including small businesses, not-for-profit organizations and small governmental jurisdictions.

Agencies must perform a review to determine whether a proposed or final rule will have a significant economic impact on a substantial number of small entities. If the determination is that it will have such an impact, the agency must prepare a regulatory flexibility analysis as described in the Act. However, if an agency determines that a proposed, or final, rule is not expected to have a significant economic impact on a substantial number of small entities, section 605(b) of the Act provides that the head of the agency may so certify and a regulatory flexibility analysis is not required. The certification must include a statement providing the factual basis for this determination, and the reasoning should be clear.

The changes to the IFR are cost relieving, thus are not expected to have a significant economic impact on a substantial number of small entities. The FAA presents the factual basis below.

For the IFR, the FAA conducted a complete regulatory flexibility analysis to assess the impact on small entities. This rule will affect operators of certain airplanes operated under parts 121, 129, and 135. For operators, a small entity is defined as one with 1,500 or fewer employees. As there are operators that meet these criteria for a small business, calculations were done to assess whether the rule will have a significant impact on a substantial number of these operators.

Issues To Be Addressed in a Final Regulatory Flexibility Analysis (FRFA)

The central focus of the FRFA, like the Initial Regulatory Flexibility Analysis, is the requirement that agencies evaluate the impact of a rule on small entities and analyze regulatory alternatives that minimize the impact when there will be a significant economic impact on a substantial number of small entities.

The requirements, outlined in section 604(a)(1–5) of the RFA, appear in items 1 through 5 below. The FAA's response follows each requirement.

(1) A succinct statement of the need for, and objectives of, the rule.

This rule represents a critical step toward compliance with the Aging Aircraft Safety Act of 1991. Section 44717 of Title 49 U.S.C. instructs the Administrator to ''prescribe regulations that ensure the continuing airworthiness of aging aircraft.'' The law also requires ''the Administrator to make inspections, and review the maintenance and other records, of each aircraft an air carrier uses to provide air transportation.'' The objectives of the rule are to ensure the continuing airworthiness of aging airplanes operating in air transportation.

(2) A summary of the significant issues raised by the public comments in response to the Initial Regulatory Flexibility Analysis (IRFA), a summary of the assessment of the agency of such issues, and a statement of any changes made in the proposed rule as a result of such comments.

There were few public comments explicitly on the Initial Regulatory Flexibility Analysis. There were several comments from part 135 operators that discuss the financial burden the IFR would place on them. Many part 135 operators have fewer than 1,500 employees and are considered small entities.

In response to public comments, the FAA revised the supplemental inspection requirement by narrowing the applicability to transport category, turbine powered airplanes with a type certificate issued January 1, 1958, that because of original type certification or later increase in capacity, have a maximum type-certificated passenger seating capacity of 30 or more or a maximum payload capacity of 7500 pounds or more. This change excepted part 135 operators from having to implement a supplemental inspection program.

(3) A description of, and an estimate of the number of, small entities to which the rule will apply or an explanation of why no such estimate is available.

On December 8, 2003, the Aging Airplane Safety IFR was codified. After the FAA's review of the Aging Airplane Program and comments to the IFR, the FAA made the changes to the IFR that are reflected in this final rule. The FAA has determined that these changes impose no additional costs and provide cost relief to small entities. No description or estimated number of small entities is given as the final rule provides only cost relief to these operators.

(4) A description of the projected reporting, recordkeeping, and other compliance requirements of the rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record.

The changes to the IFR will result in no additional paperwork burden.

(5) A description of the steps the agency has taken to minimize the significant economic impact on small entities consistent with the stated objectives of applicable statutes, including a statement of the factual, policy, and legal reasons for selecting the alternative adopted in the final rule and why each one of the other significant alternatives to the rule considered by the agency which affect the impact on small entities was rejected.

The changes the FAA made to the IFR resulted in part 135 operators not having to implement supplemental inspection programs. This decreased the cost burden for these operators, many of whom are small entities.

Description of Alternatives

The FAA considered several alternative approaches to this rulemaking action. One was to retain the provisions of the rule as set forth in the IFR. The FAA rejected this alternative after a review of the Aging Airplane Program initiatives and comments to the IFR. We determined that better aligning certain compliance dates in existing aging airplane rules and pending proposals and making certain substantive changes to them would increase their cost-effectiveness without compromising safety. The FAA included the Aging Airplane Safety rule in the review. The results were the removal of the supplemental inspection requirement for certain airplanes and the extension of the supplemental inspection compliance date for those airplanes still subject to the rule.

Another alternative came from commenters to the IFR. They recommended the FAA withdraw the rule. The FAA rejected this alternative because the rule is based on a congressional mandate, which requires the FAA to implement regulations to ensure the continuing airworthiness of aging aircraft.

Compliance Assistance

The FAA has tasked the Aviation Rulemaking Advisory Committee (ARAC) to review and make recommendations on the contents of AC 91–56B, Continuing Structural Integrity Programs for Airplanes. This AC will provide guidance to develop damage-tolerance-based SSIPs. The FAA intends to publish this AC before the December 20, 2010 compliance date specified in this rule. The FAA also intends to publish AC 120–84, Aging Airplane Inspections and Records Review, concurrently with this rule to help operators in complying with the airplane inspections and records reviews required by this rule.

Paperwork Reduction Act

Information collection requirements in the final rule have been previously approved by the Office of Management and Budget (OMB) under the provisions of the Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) and have been assigned OMB Control Numbers: 2120–0020, 2120–0008, and 2120–0039. Part 129 record requirements can be found in International Civil Aviation Organization Annexes.

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 regulations.

Trade Impact Assessment

The Trade Agreement Act of 1979 prohibits Federal agencies from establishing any standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. Legitimate domestic objectives, such as safety, are not considered unnecessary obstacles. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards. The FAA has assessed the potential effect of this final rule and determined that it will impose the same costs on domestic and international entities and thus have a neutral trade impact.

Unfunded Mandates Assessment

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

FAA currently uses an inflation-adjusted value of $120.7 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, or the relationship between the national Government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, we determined that this final rule does not have federalism implications.

Environmental Analysis

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

Energy Impact

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

List of Subjects

14 CFR Part 119

Air carriers, Air transportation, Aircraft, Aviation safety, Commuter operations, 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.

14 CFR Part 135

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

14 CFR Part 183

Aircraft, Authority delegations (Government agencies), Reporting and recordkeeping requirements.

The Amendment

■ In consideration of the foregoing, the Federal Aviation Administration adopts the interim final rule (IFR) published at 67 FR 72726 on December 6, 2002, and revised by technical amendment (68 FR 69307, December 12, 2003), as a final rule with the following changes:

PART 121—OPERATING REQUIREMENTS: DOMESTIC, FLAG, AND SUPPLEMENTAL OPERATIONS

■ 1. 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.

■ 2. Amend § 121.368 by revising paragraphs (d)(2) and (d)(8) introductory text to read as follows:

§ 121.368 Aging airplane inspections and records reviews.

* * * * *

(d) * * *

(2) Total time in service of the airframe;

* * * * *

(8) Current status of applicable airworthiness directives, including the date and methods of compliance, and if the airworthiness directive involves recurring action, the time and date when the next action is required:

* * * * *

■ 3. Revise § 121.370a to read as follows:

§ 121.370a Supplemental inspections.

(a) *Applicability.* Except as specified in paragraph (b) of this section, this section applies to transport category, turbine powered airplanes with a type certificate issued after January 1, 1958, that as a result of original type certification or later increase in capacity have—

(1) A maximum type certificated passenger seating capacity of 30 or more; or

(2) A maximum payload capacity of 7,500 pounds or more.

(b) *Exception.* This section does not apply to an airplane operated by a certificate holder under this part between any point within the State of Alaska and any other point within the State of Alaska.

(c) *General requirements.* After December 20, 2010, a certificate holder may not operate an airplane under this part unless the following requirements have been met:

(1) The maintenance program for the airplane includes FAA-approved damage-tolerance-based inspections and procedures for airplane structure susceptible to fatigue cracking that could contribute to a catastrophic failure. These inspections and procedures must take into account the adverse affects repairs, alterations, and modifications may have on fatigue cracking and the inspection of this airplane structure.

(2) The damage-tolerance-based inspections and procedures identified in this section and any revisions to these inspections and procedures must be approved by 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. The certificate holder must include the damage-tolerance-based inspections and procedures in the certificate holder's FAA-approved maintenance program.

Appendix N To Part 121 [Removed]

■ 4. Amend part 121 by removing Appendix N.

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

■ 5. The authority citation for part 129 continues to read as follows:

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.

■ 6. Revise § 129.16 to read as follows:

§ 129.16 Supplemental inspections for U.S.-registered aircraft.

(a) *Applicability.* This section applies to U.S.-registered, transport category, turbine powered airplanes with a type certificate issued after January 1, 1958 that as a result of original type certification or later increase in capacity have—

(1) A maximum type certificated passenger seating capacity of 30 or more; or

(2) A maximum payload capacity of 7,500 pounds or more.

(b) *General requirements.* After December 20, 2010, a foreign air carrier or foreign person may not operate an airplane under this part unless the following requirements have been met:

(1) The maintenance program for the airplane includes FAA-approved

damage-tolerance-based inspections and procedures for airplane structure susceptible to fatigue cracking that could contribute to a catastrophic failure. These inspections and procedures must take into account the adverse affects repairs, alterations, and modifications may have on the fatigue cracking and the inspection of this airplane structure.

(2) The damage-tolerance-based inspections and procedures identified in this section and any revisions to these inspections and procedures must be approved by 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. The operator must include the damage-tolerance-based inspections and procedures in the operator's FAA-approved maintenance program.

■ 7. Amend § 129.33 by revising paragraphs (c)(2) and (c)(8) introductory text to read as follows.

§ 129.33 Aging airplane inspections and records reviews for U.S.-registered multiengine aircraft.

* * * * *

(c) * * *

(2) Total time in service of the airframe;

* * * * *

(8) Current status of applicable airworthiness directives, including the date and methods of compliance, and if the airworthiness directive involves recurring action, the time and date when the next action is required:

* * * * *

Appendix B To Part 129 [Removed]

■ 8. Amend part 129 by removing Appendix B.

PART 135—OPERATING REQUIREMENTS: COMMUTER AND ON-DEMAND OPERATIONS AND RULES GOVERNING PERSONS ON BOARD SUCH AIRCRAFT

■ 9. The authority citation for part 135 continues to read as follows:

Authority: 49 U.S.C. 106(g), 41706, 44113, 44701–44702, 44705, 44709, 44711–44713, 44715–44717, 44722.

§ 135.168 [Removed and reserved]

■ 10. Remove and reserve §135.168.

■ 11. Amend § 135.411 by revising paragraphs (a)(1) and (a)(2) to read as follows:

§ 135.411 Applicability.

(a) * * *

(1) Aircraft that are type certificated for a passenger seating configuration, excluding any pilot seat, of nine seats or less, shall be maintained under parts 91 and 43 of this chapter and §§ 135.415, 135.416, 135.417, 135.421 and 135.422. An approved aircraft inspection program may be used under § 135.419.

(2) Aircraft that are type certificated for a passenger seating configuration, excluding any pilot seat, of ten seats or more, shall be maintained under a maintenance program in §§ 135.415, 135.416, 135.417, and 135.423 through 135.443.

* * * * *

■ 12. Amend part 135, by revising § 135.422 to read as follows:

§ 135.422 Aging airplane inspections and records reviews for multiengine airplanes certificated with nine or fewer passenger seats.

(a) *Applicability.* This section applies to multiengine airplanes certificated with nine or fewer passenger seats, operated by a certificate holder in a scheduled operation under this part, except for those airplanes operated by a certificate holder in a scheduled operation between any point within the State of Alaska and any other point within the State of Alaska.

(b) *Operation after inspections and records review.* After the dates specified in this paragraph, a certificate holder may not operate a multiengine airplane in a scheduled operation under this part unless the Administrator has notified the certificate holder that the Administrator has completed the aging airplane inspection and records review required by this section. During the inspection and records review, the certificate holder must demonstrate to the Administrator that the maintenance of age-sensitive parts and components of the airplane has been adequate and timely enough to ensure the highest degree of safety.

(1) *Airplanes exceeding 24 years in service on December 8, 2003; initial and repetitive inspections and records reviews.* For an airplane that has exceeded 24 years in service on December 8, 2003, no later than December 5, 2007, and thereafter at intervals not to exceed 7 years.

(2) *Airplanes exceeding 14 years in service but not 24 years in service on December 8, 2003; initial and repetitive inspections and records reviews.* For an airplane that has exceeded 14 years in service, but not 24 years in service, on December 8, 2003, no later than December 4, 2008, and thereafter at intervals not to exceed 7 years.

(3) *Airplanes not exceeding 14 years in service on December 8, 2003; initial and repetitive inspections and records reviews.* For an airplane that has not exceeded 14 years in service on December 8, 2003, no later than 5 years after the start of the airplane's 15th year in service and thereafter at intervals not to exceed 7 years.

(c) *Unforeseen schedule conflict.* In the event of an unforeseen scheduling conflict for a specific airplane, the Administrator may approve an extension of up to 90 days beyond an interval specified in paragraph (b) of this section.

(d) *Airplane and records availability.* The certificate holder must make available to the Administrator each airplane for which an inspection and records review is required under this section, in a condition for inspection specified by the Administrator, together with the records containing the following information:

(1) Total years in service of the airplane;

(2) Total time in service of the airframe;

(3) Date of the last inspection and records review required by this section;

(4) Current status of life-limited parts of the airframe;

(5) Time since the last overhaul of all structural components required to be overhauled on a specific time basis;

(6) Current inspection status of the airplane, including the time since the last inspection required by the inspection program under which the airplane is maintained;

(7) Current status of applicable airworthiness directives, including the date and methods of compliance, and, if the airworthiness directive involves recurring action, the time and date when the next action is required;

(8) A list of major structural alterations; and

(9) A report of major structural repairs and the current inspection status for these repairs.

(e) *Notification to the Administrator.* Each certificate holder must notify the Administrator at least 60 days before the date on which the airplane and airplane records will be made available for the inspection and records review.

§ 135.423 [Removed]

■ 13. Amend part 135 by removing § 135.423.

§ 135.424 [Redesignated]

■ 14. Redesignate § 135.424 as § 135.423.

Appendix G To Part 135 [Removed]

■ 15. Amend part 135 by removing Appendix G.

Issued in Washington, DC, on January 25, 2005.

Marion C. Blakey,

Administrator.

[FR Doc. 05–1756 Filed 2–1–05; 8:45 am]

BILLING CODE 4910–13–P