Federal Register

Monday,
November 15, 2010

Part II

Department of Transportation

Federal Aviation Administration

14 CFR Parts 25, 26, 121, et al.
Aging Airplane Program: Widespread Fatigue Damage; Final Rule

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 25, 26, 121, and 129

[Docket No. FAA–2006–24281; Amendment Nos. 25–132, 26–5, 121–351, 129–48]

RIN 2120–AI05

Aging Airplane Program: Widespread Fatigue Damage

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: This final rule amends FAA regulations pertaining to certification and operation of transport category airplanes to prevent widespread fatigue damage in those airplanes. For certain existing airplanes, the rule requires design approval holders to evaluate their airplanes to establish a limit of validity of the engineering data that supports the structural maintenance program (LOV). For future airplanes, the rule requires all applicants for type certificates, after the affective date of the rule, to establish an LOV. Design approval holders and applicants must demonstrate that the airplane will be free from widespread fatigue damage up to the LOV. The rule requires that operators of any affected airplane incorporate the LOV into the maintenance program for that airplane. Operators may not fly an airplane beyond its LOV unless an extended LOV is approved.

DATES: These amendments become effective January 14, 2011.

FOR FURTHER INFORMATION CONTACT: If you have technical questions concerning this rule, contact Walter Sippel, ANM–115, Airframe/Cabin Safety Branch, Federal Aviation Administration, 1601 Lind Avenue SW., Renton, WA 98057–3356; telephone (425) 227–2774; facsimile (425) 227–1232; e-mail *walter.sippel@faa.gov.* If you have legal questions, contact Doug Anderson, Office of Regional Counsel, Federal Aviation Administration, 1601 Lind Avenue SW., Renton, WA 98057–3356; telephone (425) 227–2166; facsimile (425) 227–1007; e-mail *douglas.anderson@faa.gov.*

SUPPLEMENTARY INFORMATION:

Authority for This Rulemaking

The FAA's authority to issue rules on aviation safety is found in Title 49 of the United States Code. Subtitle I, section 106 describes the authority of the FAA Administrator. Subtitle VII–Aviation Programs describes in more detail the scope of the agency's authority.

This rulemaking is promulgated under the authority described in subtitle VII, part A, subpart III, section 44701, "General requirements." Under that section, the FAA is charged with promoting safe flight of civil aircraft in air commerce by prescribing minimum standards required in the interest of safety for the design and performance of aircraft; regulations and minimum standards in the interest of safety for inspecting, servicing, and overhauling aircraft; and regulations for other practices, methods, and procedures the administrator finds necessary for safety in air commerce. This regulation is within the scope of that authority because it prescribes—

- New safety standards for the design of transport category airplanes, and
- New requirements necessary for safety for the design, production, operation and maintenance of those airplanes and for other practices, methods, and procedures relating to those airplanes.

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I. Executive Summary

This final rule requires certain actions to prevent catastrophic failure due to widespread fatigue damage (WFD) throughout the operational life of certain existing transport category airplanes and all those to be certificated in the future. Existing airplanes subject to the rule are turbine-powered airplanes with a type certificate issued after January 1, 1958, which have a maximum takeoff gross weight greater than 75,000 pounds and are operated under part 121 or 129. The rule applies to all transport category airplanes to be certificated in the future, regardless of maximum takeoff gross weight or how they are operated. The benefits of this rule are estimated at a present value of $4.8 million. The cost is estimated at a present value of $3.6 million.

FIGURE 1—WFD FINAL RULE BENEFITS AND COSTS

	Nominal value ($ millions)	7% Present value ($ millions)
Benefits	9.8	4.8
Costs	3.8	3.6

Fatigue damage to a metallic structure occurs when the structure is subjected to repeated loads, such as the pressurization and depressurization that occurs with every flight of an airplane. Over time this fatigue damage results in cracks in the structure, and the cracks may begin to grow together. Widespread fatigue damage is the simultaneous presence of fatigue cracks at multiple structural locations that are of sufficient size and density that the structure will no longer meet the residual strength requirements of § 25.571(b).[1] Structural fatigue characteristics of airplanes are understood only up to the point where analyses and testing of the structure are valid. There is concern about operating an airplane beyond that point for several reasons. One reason is that WFD is increasingly likely as the airplane ages, and is certain if the airplane is operated long enough. Another is that existing inspection methods do not reliably detect WFD because cracks are initially so small and may then link up and grow so rapidly that the affected structure fails before an inspection can be performed to detect the cracks.

To preclude WFD related incidents in existing transport category airplanes, this final rule requires holders of design approvals for those airplanes subject to the rule to perform the following actions:

1. Establish a limit of validity of the engineering data that supports the structural maintenance program (LOV);
2. Demonstrate that WFD will not occur in the airplane prior to reaching the LOV; and
3. Establish or revise the Airworthiness Limitations section in the Instructions for Continued Airworthiness to include the LOV.

As used in this preamble, the term "design approval holders" includes holders of type certificates, supplemental type certificates, or amended type certificates, and applicants for such approvals. In the context of this final rule, the design approval holder is generally the type certificate holder. Requiring design approval holders to perform the actions listed above is intended to support compliance by operators with today's amendments to parts 121 and 129. This final rule amends those parts to require that operators incorporate the LOV as airworthiness limitations into their maintenance program for each affected model that they operate.

The amendments to the operating rules have the effect of prohibiting operation of an airplane beyond its LOV. However, today's rule provides an option for any person to extend the LOV for an airplane and to develop the maintenance actions which support the extended limit. Thereafter, to operate an airplane beyond the existing LOV, an operator must incorporate the extended LOV and associated maintenance actions into its maintenance program. The airplane may not be operated beyond the extended LOV.

In response to comments on the notice of proposed rulemaking, the FAA has made a number of substantive changes which significantly reduce the costs presented in the proposal. The FAA has—

- Eliminated the requirement to evaluate WFD associated with most repairs, alterations, and modifications of the baseline[2] airplane structure.
- Simplified how an LOV may be extended.
- Extended the compliance dates by which design approval holders must establish an LOV for existing airplanes.
- Extended the time for operators to incorporate LOVs into their maintenance programs.
- Limited the applicability of the final rule to "transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958."

Today's rule requires that design approval holders take the necessary steps to preclude WFD in the future by requiring that they establish LOVs. Although the rule allows design approval holders to establish LOVs without relying on maintenance actions, the FAA expects most current design approval holders to adopt LOVs that will rely on such actions. Since WFD is by definition a condition in which structure will no longer meet the residual strength requirements of § 25.571(b), it could lead to a catastrophic failure. Thus the FAA would mandate those maintenance actions by airworthiness directive. The agency expects these actions to greatly reduce the number of unanticipated inspections and repairs resulting from emergency airworthiness directives the FAA issues when WFD is discovered in service. The FAA estimates the value of managing WFD with maintenance actions developed under this final rule versus the current practice of issuing airworthiness directives as WFD is found is worth $4.8 million in present value. There are other benefits of this rule that were not included in the final benefit assessment. They include prevention of accidents and a longer economic life for the airplane. The FAA estimates that this rule will cause one airplane to be retired because of its reaching the anticipated LOV in the 20-year analysis period. The retirement of this one airplane will result in costs of approximately $3.8 million, with a present value of approximately $3.6 million. This operator's cost is the only cost attributed to the final rule, since manufacturer costs were found to be minimal.

Thus, as noted earlier, this final rule's estimated present value benefits of $4.8 million exceed the estimated present value costs of approximately $3.6 million.

II. Background

A. Summary of the NPRM

On April 18, 2006, the FAA published a notice of proposed rulemaking (NPRM), entitled Aging Aircraft Program: Widespread Fatigue Damage.[3] That proposal was based on a recommendation from the Aviation Rulemaking Advisory Committee (ARAC). The NPRM contained extensive requirements for setting and supporting an initial operational limit for an airplane model. The FAA proposed that the rule apply to transport category airplanes with a maximum gross takeoff weight of greater than 75,000 pounds. The due date for comments was July 17, 2006.

The FAA proposed that design approval holders for those airplanes be required to take actions to preclude WFD. For new airplanes, the FAA proposed to amend § 25.571 and Appendix H to part 25 to require that applicants for a new type certificate establish an initial operational limit and include that limit in the Airworthiness Limitations section of the Instructions for Continued Airworthiness for the airplane. The agency also proposed that applicants develop guidelines for evaluating repairs, alterations, and modifications for WFD.

[1] After sustaining a certain level of damage, the remaining structure must be able to withstand certain static loads without failure. In the context of WFD, the damage is a result of the simultaneous presence of fatigue cracks at multiple locations in the same structural element (*i.e.,* multiple site damage) or the simultaneous presence of fatigue cracks in similar adjacent structural elements (*i.e.,* multiple element damage).

[2] Baseline structure means structure that is designed under the original type certificate or amended type certificate for that airplane model.

[3] 71 FR 19928

Section 25.1807 proposed that holders of design approvals for existing airplanes or applicants for such approvals be required to do the following:

1. Establish an initial operational limit; and

2. Establish a new Airworthiness Limitations section or revise an existing Airworthiness Limitations section to include the initial operational limit.

Section 25.1807(g) proposed that holders of design approvals for existing airplanes or applicants for such approvals be required to prepare the following:

1. A list of repairs and modifications developed and documented by the design approval holder;

2. Service information for maintenance actions necessary to preclude WFD from occurring before the initial operational limit; and

3. Guidelines for identifying, evaluating, and preparing service information for repairs, alterations, and modifications for which no service information exists.

For existing airplanes for which an initial operational limit is established, § 25.1809 proposed that design changes be evaluated for susceptibility to WFD and, if a change were susceptible, that the design approval holder identify when WFD is likely to occur and whether maintenance actions would be required. Section 25.1811 provided that any person could apply to extend an operational limit, using a process similar to that for establishing the initial operational limit. Under § 25.1813, certain repairs, alterations, and modifications proposed for installation on airplanes with an extended operational limit would also be evaluated.

The FAA proposed to amend the operating requirements of parts 121 and 129 to require that no operator could operate an airplane unless the initial operational limit or extended operational limit for the airplane had been incorporated into the operator's maintenance program.

The NPRM contains the background and rationale for this rulemaking and, except where the FAA has made revisions in this final rule, should be referred to for that information.

B. Related Activities

In July 2004, the FAA published the notice entitled "Fuel Tank Safety Compliance Extension (Final Rule) and Aging Airplane Program Update (Request for Comments)"[4] to propose airworthiness requirements for design approval holders to support certain operational rules. The FAA requested comments on the agency's proposal.

In July 2005, the FAA published a disposition of comments received in response to our request.[5] Also in July 2005, the agency published a policy statement, "Safety–A Shared Responsibility–New Direction for Addressing Airworthiness Issues for Transport Airplanes,"[6] that explains our reasons for adopting requirements for design approval holders.

On May 22, 2006, the FAA published a Notice of Availability and request for comments on proposed Advisory Circular (AC) 120–YY, Widespread Fatigue Damage on Metallic Structure. The notice stated that the proposed AC could be found on the Internet at *http://www.faa.gov/aircraft/draft_docs.* This proposed advisory circular provides guidance to design approval holders on establishing initial and extended operational limits to preclude WFD for certain transport category airplanes and evaluating repairs, alterations, and modifications to the airplanes. The advisory circular also provides guidance to operators on incorporating the initial or extended operational limit and any related airworthiness limitation items into their maintenance programs. The notice specified that comments on the proposed advisory circular were to be received by July 17, 2006.

On July 7, 2006, at the request of a number of commenters, the FAA published a notice[7] extending the comment period on both the NPRM and proposed AC 120–YY to September 18, 2006. On August 18, 2006, the agency posted proposed AC 25.571–1X, Damage Tolerance and Fatigue Evaluation of Structure, on the Internet at *http://www.faa.gov/aircraft/draft_docs.* Comments on this document, which proposed revision of existing AC 25.571–1C, were due by October 21, 2006.

On November 26, 2006, the FAA held a public meeting with the ARAC Transport Airplane and Engine Issues Group. Under ARAC, the Airworthiness Assurance Working Group (AAWG) had previously provided recommendations to the FAA on how to address widespread fatigue damage. Because the FAA had received several comments concerning differences between the AAWG's recommendations and the NPRM, the meeting was held to discuss the reasons for these differences. The FAA's presentation at the meeting has been placed in the docket for this rulemaking. Except as discussed in the context of specific issues affecting this final rule, the FAA will not revisit those differences here.

On December 11, 2008, at the request of the Acting Administrator, the FAA held a public meeting to allow comments on the changes that had occurred to the rule since it had been proposed in the NPRM. A Technical Document describing those changes was posted in the docket, and the announcement of the meeting and opening of the comment period for the Technical Document was published in the **Federal Register** on Nov. 7, 2008 (73 FR 66205). The public was invited to submit comments on the Technical Document either in person at the meeting or by sending them to the docket. Seventy-one people attended the meeting and Boeing, the Air Transport Association of America (ATA), and FedEx made presentations, along with the FAA. Many attendees commented or asked questions. In addition, 12 commenters submitted comments about the Technical Document to the docket. The comment period closed on December 22, 2008.

While some of the comments received during the comment period for the Technical Document were new, many were restatements of comments made after publication of the NPRM. We address all of the comments, from both comment periods, in the section below. Comments received during both comment periods are posted to the docket. A transcript of the public meeting, including presentations given and comments delivered there, may also be found in the docket.

C. Differences Between NPRM and Final Rule

1. Substantive Changes

The FAA has eliminated the requirement to evaluate WFD associated with most repairs, alterations, and modifications of the baseline airplane structure.[8] The agency has also made a change in terminology. This final rule uses the term "limit of validity of the engineering data that supports the maintenance program" (LOV) rather than the term "initial operational limit." The FAA finds that the term "limit of validity" is more appropriate than the term "initial operational limit" in defining the point to which an airplane

[4] 69 FR 45936, July 30, 2004.

[5] 70 FR 40168, July 12, 2005: Fuel Tank Safety Compliance Extension (final rule) and Aging Airplane Program Update (Request for comments).

[6] 70 FR 40166, July 12, 2005 (PS–ANM110–7–12–2005).

[7] 71 FR 38540.

[8] The final rule requires that design approval holders evaluate airplane configurations that include modifications mandated by airworthiness directive.

may be safely operated. The requirements in this final rule for establishing the LOV under § 26.21 are that it be supported by test evidence and analysis at a minimum and, if available, by service experience or service experience and teardown inspection results for those airplanes of similar structural design with the highest total accumulation of flight cycles or flight hours (commonly referred to as high-time airplanes). This criterion is similar to the criterion used in § 25.571(b). This final rule also clarifies how the LOV may be extended, using the same type of evaluation as that required for setting the LOV under § 26.21.

In response to requests for more time, the FAA has extended the compliance dates by which design approval holders must establish an LOV for existing airplanes. Those dates vary according to the age of the airplanes, from 18 months after the effective date for the oldest airplanes to 60 months after the effective date for the newest ones. Additionally, the agency has extended the time for operators to incorporate LOVs into their maintenance programs. These dates vary with the age of the airplanes as well, and are 12 months later than the related design approval compliance dates, thus giving operators 12 months to incorporate the LOV into their maintenance programs. Operator compliance dates range from 30 to 72 months after the effective date. The FAA has also changed the proposed operational rules to correct an inadvertent ambiguity in the NPRM regarding obligations of operators of airplanes for which the type certificate holder might fail to establish an LOV as required.

Another change involves applicability to existing transport category airplanes. This final rule applies to "transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958." This limitation was added to make applicability of today's rule consistent with that of the other aging airplane rules. The FAA also added airplanes to the list of those excluded from the LOV requirements of § 26.21 because the airplanes are not operated under parts 121 or 129. Either they are being operated under different parts of the Code of Federal Regulations (CFR) or they are not in service at this time. The number of these airplanes still operating is very small, and the probability of their retirement in the near future is high.

2. Regulatory Evaluation Changes

The FAA has substantially revised the Regulatory Evaluation for several reasons. One concerns differences between the rule as proposed and the final rule. For example, the requirement to evaluate WFD associated with repairs, alterations, and modifications of the baseline airplane structure, except for those mandated by airworthiness directives, has been eliminated from this final rule. Another reason concerns information received during the rulemaking process which indicated that some of the initial assumptions about benefits and costs of the rule were not valid. For example, initially, the FAA assumed that design approval holders would set the LOV for a specific airplane model at the design service goal for that model. However, subsequently, some design approval holders indicated that they planned to set the LOV 33% to 180% higher. The net effect of these changes has been to dramatically reduce the costs estimated for compliance with the rule.

Our revised Regulatory Evaluation lists three potential sources of benefits of the rule, namely (1) prevention of accidents; (2) extension of the economic life of the airplane with corresponding revenues from that additional economic life; and (3) near elimination of emergency airworthiness directives.

Preventing a WFD accident is estimated to have benefits ranging from $20 million to $680 million. There are multiple factors, however, that make it difficult to forecast that this rule absolutely would prevent accidents. Among them are earlier FAA rulemaking actions to prevent known fatigue problems from reoccurring.

Similarly, although specific maintenance actions designed to extend the life of airplane structure have added years of service to the DC–9 fleet, quantification of such values for other models is unnecessary, given that benefits already exceed the nearly minimal costs.

As a result, the quantified benefit of this final rule is based solely on the near elimination of emergency ADs pertaining to WFD. The analysis assumes the rule will prevent 1.5 days of down time associated with emergency ADs.

3. New Part 26 for Design Approval Holders' Airworthiness Requirements

In the WFD proposed rule, and in proposals for other Aging Airplane Program rules, the FAA placed the airworthiness requirements for design approval holders in part 25, subpart I. As explained in the Enhanced Airworthiness Program for Airplane Systems/Fuel Tank Safety final rule (EAPAS/FTS),[9] the FAA decided after further review and input from industry and foreign aviation authorities to place these requirements in a new part 26 and move the enabling regulations into part 21.[10] The FAA determined that this was the best course of action because it keeps part 25 applicable only to airworthiness standards for transport category airplanes. This is important because it maintains harmonization and compatibility among the United States, Canada, and the European Union regulatory systems. Providing references to part 26 in part 21 clarifies how the part 26 requirements will address existing and future design approvals.

In creating part 26, the FAA renumbered the proposed sections of part 25, subpart I, and incorporated the changes discussed in this preamble. A table of this renumbering is shown below.

FIGURE 2—TABLE SHOWING RELATIONSHIP OF PROPOSED PART 25 SUBPART I TO PART 26 FINAL RULE

Part 26 final rule	Proposed part 25
SUBPART C—Aging Airplane Safety—Widespread Fatigue Damage	Subpart I—Continued Airworthiness
§ 26.5 Applicability table	New [11]
§ 26.21 Limit of validity (LOV)	§ 25.1807 Initial operational limit: Widespread Fatigue Damage (WFD).
	§ 25.1809 Changes to type certificates: Widespread Fatigue Damage (WFD).
§ 26.23 Extended limit of validity (LOV)	§ 25.1811 Extended operational limit: Widespread Fatigue Damage (WFD)

[9] 72 FR 63363, November 8, 2007.

[10] Certification Procedures for Products and Parts.

[11] This section, which includes an applicability table for part 26, was adopted as part of the EAPAS final rule.

FIGURE 2—TABLE SHOWING RELATIONSHIP OF PROPOSED PART 25 SUBPART I TO PART 26 FINAL RULE—Continued

Part 26 final rule	Proposed part 25
	§ 25.1813 Repairs, alterations, and modifications: Widespread Fatigue Damage (WFD).

4. New Subparts for Airworthiness Operational Rules

The WFD NPRM was among several Aging Airplane Program rulemaking initiatives that proposed new subparts (subparts AA and B in parts 121 and 129, respectively) for airworthiness requirements, and redesignated certain sections of parts 121 and 129. Since the EAPAS/FTS final rule was the first of these rulemaking initiatives to be codified, the new subparts and redesignated sections were adopted in that rule. Therefore, the FAA has removed the regulatory language and related discussion about these changes from this final rule. This final rule adds new sections that include WFD-related requirements: §§ 121.1115 and 129.115.

D. Summary of Comments

The FAA received comments about the NPRM from 40 commenters, including airplane manufacturers, operators, aviation associations, and others. The comments covered an array of topics and contained a range of responses. There was much support from airplane manufacturers, operators, and associations for the concept of precluding WFD in aging airplanes. There were also a number of recommendations for changes and requests for clarification. As previously discussed, at the December 11, 2008 public meeting, Boeing, FedEx, and ATA gave presentations of their responses to the Technical Document.

In addition, the FAA received comments about airworthiness requirements for design approval holders. We addressed many of the same or similar comments in the July 2005 disposition of comments document to the Fuel Tank Safety Compliance Extension (Final Rule) and Aging Airplane Program Update (Request for Comments). We also explained in detail the need for these requirements in our July 2005 policy statement. As a result, the FAA will not revisit those comments here.

III. Discussion of the Final Rule

A. Overview

1. Widespread Fatigue Damage

Widespread fatigue damage is the simultaneous presence of cracks at multiple structural locations that are of sufficient size and density that the structure will no longer meet the residual strength requirements of 14 CFR 25.571(b). This may result in catastrophic structural failure and loss of the airplane.

Fatigue is the gradual deterioration of a material subjected to repeated structural loads. When it occurs in more than one location, cracks manifest themselves as multiple site damage or multiple element damage. Multiple site damage is the simultaneous presence of fatigue cracks at multiple locations that grow together in the same structural element, such as a large skin panel or lap joint. Multiple element damage is the simultaneous presence of fatigue cracks in similar adjacent structural elements, such as frames or stringers. Some structural elements are susceptible to both types of damage, and both types may occur at the same time.

Cracks associated with multiple site damage and multiple element damage are initially so small that they cannot be reliably detected with existing inspection methods. Widespread fatigue damage is especially hazardous because these small, undetectable cracks in metallic structure can "link up" and grow very rapidly to bring about catastrophic failure of the structure. Although operators perform routine structural inspections to detect fatigue damage, fatigue cracks related to WFD grow so rapidly that operators cannot inspect susceptible structures often enough to detect the cracks before they cause structural failure. As a result, many of the findings of these types of cracks have been fortuitous: mechanics and others have observed fatigue cracks while doing other work. For example, cracks have been found by workers while stripping and painting an airplane. Cracks have also been found by mechanics conducting unrelated inspections of skin anomalies on the external fuselage; further investigation revealed multiple cracks in stringers and circumferential joints.

In other cases, undetected multiple site damage in wing or fuselage structure has eventually led to catastrophic failure of the structure in flight. For example, wing failures have resulted in losses of C–130 and P4Y–2 airplanes. Failures of aft pressure bulkheads have caused decompression of B–747, DC–9, and L–1011 airplanes.

Concern about WFD was brought to the forefront of public attention in April 1988, when an 18-foot-long section of the upper fuselage of a Boeing Model 737 airplane separated from the airplane during flight. The airplane, operated by Aloha Airlines, was en route from Hilo to Honolulu, Hawaii, at 24,000 feet. Onboard were 89 passengers and 6 crewmembers. A flight attendant died as a result of the accident, and eight passengers were injured.

The damage to the airplane consisted of a total separation and loss of a major portion of the upper crown skin and other structure. The damaged area extended from the main cabin entrance door aft for about 18 feet. At the time of the accident, the airplane had accumulated 89,680 flight cycles and 35,496 flight hours.

In the years after the Aloha Airlines accident, WFD was discovered in the following airplanes:

- *Boeing 727:* Cracking along a lap joint.

In 1998, during maintenance, two cracks were found growing out from underneath the lap joint. Disassembly of the joint revealed a 20-inch hidden crack from multiple site damage on the lower row of rivet holes in the inner skin.

- *Boeing 737:* Cracking along a lap joint.

In July 2003, a mechanic preparing to paint discovered extensive multiple site damage with up to 10 inches of local link-up of cracks in one area.

- *Boeing 747:* Cracking of the aft pressure bulkhead.

In 2005, Boeing issued service information to address multiple site damage of the aft pressure bulkhead radial lap splices. The service information was based on analysis and fatigue testing of the aft pressure bulkhead.

- *Boeing 767:* Cracking of the aft pressure bulkhead.

On November 5, 2003, cracks were found at multiple sites common to a single radial lap splice during an inspection of the aft pressure bulkhead.

- *McDonnell Douglas DC–9:* Cracking of the aft pressure bulkhead.

On June 22, 2003, widespread fatigue damage on a DC–9 airplane led to rapid decompression at 25,000 feet. Later inspection revealed multiple site

damage with extensive link-up of cracks.

• *Lockheed C–130A:* Fatigue cracks in the wing structure.

On August 13, 1994, while responding to a forest fire in the Tahachapi Mountains near Pearblossom, California, the airplane experienced an in-flight separation of the right wing. All 3 flight crewmembers were killed, and the airplane was completely destroyed.

• *Lockheed C–130A:* Fatigue cracks in the wing structure.

On June 17, 2002, while executing a fire retardant drop over a forest fire near Walker, California, the airplane's wings folded upward at the center wing-to-fuselage attachment point, and the airplane broke apart. All three flight crewmembers were killed, and the airplane was completely destroyed.

• *Consolidated-Vultee P4Y–2:* Fatigue cracks in the wing structure.

On July 18, 2002, the airplane was maneuvering to deliver fire retardant over a forest fire near Estes Park, Colorado, when its left wing separated from the airplane. Both flight crewmembers were killed, and the airplane was destroyed. An examination of other Consolidated-Vultee P4Y–2 airplanes revealed that the area was difficult to inspect because of its location relative to fuselage structure.

• *Lockheed L–1011:* Failure in-flight of the aft pressure bulkhead stringer attach fittings.

In August 1995, an L–1011 airplane experienced a rapid decompression at 33,000 feet. Twenty stringer end fittings were found severed and the aft pressure bulkhead was separated from the fuselage crown by a crack approximately 12 feet long. The flight crew was unable to maintain cabin pressure control until after rapid descent.

• *Boeing 747:* Cracking of adjacent fuselage frames.

In 2005, during an overnight maintenance visit, missing skin fasteners common to a fuselage frame were discovered in the upper deck area. Further inspection revealed that the frame was severed. Substantial cracking was also found in the adjacent left and right frames.

• *Airbus A300:* Cracking of adjacent fuselage frames.

In 2002, investigations conducted as a result of fatigue cracks found on a test article and later in service revealed that cracking of certain adjacent fuselage frames could result in multiple element damage. The determination was based on analysis, service experience, and fatigue testing.

Since 1988, the FAA has issued approximately 100 airworthiness directives to address WFD in airplanes. Approximately 25 percent of these airworthiness directives were too urgent to allow the public an opportunity to comment in advance. These airworthiness directives required inspections, and the FAA later superseded the majority of them to expand the inspections or require modifications because inspections were not enough to preclude WFD.

Shortly after the Aloha Airlines accident, the AAWG [12] was formed to identify procedures to ensure continued structural airworthiness of aging transport category airplanes. Basic approaches defined by the group and accepted by the FAA included recommending procedures to preclude WFD in those airplanes. When ARAC was formed in 1991 to provide advice and recommendations on safety-related matters to the FAA, the AAWG became a working group under its auspices. In 2003 the AAWG completed its recommendation on WFD.

In 2004, the FAA tasked ARAC to "provide a written report on part 121 and 129 certificate holders operating airplanes with a maximum takeoff gross weight of greater than 75,000 pounds to assess the WFD characteristics of structural repairs, alterations, and modifications as recommended in a previous tasking of the Aviation Rulemaking Advisory Committee." [13] During the comment period on the NPRM for this final rule, the AAWG was working to complete Task 3, to recommend how an operator would include consideration of WFD for repairs, alterations, and modifications to airplanes operated under part 121 or 129.

On April 17, 2007, the AAWG presented its final report on Task 3 to ARAC. Many of the conclusions and recommendations in the final report are the same as those provided in the comments on the proposed rule which are discussed in this preamble.

2. Final Rule

This final rule requires actions to preclude WFD in transport category airplanes. It applies to both existing transport category airplanes that have a maximum takeoff gross weight greater than 75,000 pounds and to all transport category airplanes to be certified in the future, regardless of the maximum takeoff weight.

Today's rule imposes requirements on those holding design approvals for existing transport category airplanes that are subject to the rule. The design approval holders are required to evaluate the structural configuration of each model for which they hold a type certificate to determine its susceptibility to WFD and, if it is susceptible, to determine that WFD would not occur before the proposed LOV. The evaluation would be based on test evidence and analysis at a minimum and, if available, service experience or service experience and teardown inspection results of airplanes with a high number of total accumulated flight cycles or flight hours or both, which are frequently referred to as high-time airplanes. The evaluation would be performed on airplanes of similar structural design, accounting for differences in operating conditions and procedures. Using the results of the evaluation, the design approval holder must then establish an LOV.

Holders of approvals for design changes that increase an airplane's maximum takeoff gross weight to more than 75,000 pounds, or decrease it from more than 75,000 pounds to 75,000 pounds or less after the effective date of the rule, must also evaluate the affected airplanes for WFD and establish LOVs for those airplanes.

The final rule amends Appendix H to part 25 to require that the LOV which is established by the design approval holder be included in the Airworthiness Limitations section of the Instructions for Continued Airworthiness. It also amends operating rules in parts 121 and 129 to require that operators of an affected airplane incorporate into their maintenance programs an Airworthiness Limitations section that includes an LOV for that airplane.

The amendments to parts 121 and 129 have the effect of prohibiting operation of an airplane beyond its LOV.[14] For

[12] The group was initially known as the Airworthiness Assurance Task Force.

[13] Task 3.—Widespread Fatigue Damage (WFD) of Repairs, Alterations, and Modifications. Provide a written report providing recommendations on how best to enable part 121 and 129 certificate holders of airplanes with a maximum gross take-off weight of greater than 75,000 pounds to assess the WFD characteristics of structural repairs, alterations, and modifications as recommended in a previous ARAC tasking. The written report will include a proposed action plan to address and/or accomplish these recommendations including actions that should be addressed in Task 4 [below]. The report is to be submitted to the ARAC, Transport Airplane and Engine Issues Group, for approval. The ARAC, Transport Airplane and Engine Issues Group, will determine as appropriate the means by which the action plan will be implemented. The proposed actions and implementation process approved by the ARAC, Transport Airplane and Engine Issues Group, will be subject to FAA concurrence. Published in 69 FR 26641, May 13, 2004.

[14] Under 14 CFR 91.403(c), no person may operate an airplane unless applicable airworthiness limitations have been complied with. By requiring operators to incorporate the LOV airworthiness limitations developed by the design approval

Continued

transport airplane designs developed in the future, the LOV will be included in the airplane's airworthiness limitations and will apply regardless of how or by whom the airplane is operated. However, the final rule allows any person to extend the LOV for an airplane (if the person can demonstrate that it will be free of WFD up to the extended LOV) and to develop a maintenance program that supports the extended limit. Thereafter, the operator must incorporate the extended LOV and the associated maintenance actions into the Airworthiness Limitations section of its Instructions for Continued Airworthiness and may not operate the airplane beyond that limit.

The remainder of this section of the preamble discusses specific comments received.

B. Requests for Deferral or Withdrawal of Rule

The FAA received a number of comments that rulemaking to preclude WFD was not warranted and that the rule, as proposed, should be deferred or withdrawn. Commenters included United Parcel Service, American Airlines, FedEx, Cargo Airline Association (CAA), National Air Carrier Association (NACA), Lynden Air Cargo, ATA, Northwest Airlines, Transport Aircraft Technical Services, and Continental Airlines.

1. Safety Benefits Don't Justify Rule

American Airlines, ATA, and Lynden Air Cargo commented that the rule was not justified in terms of safety. They pointed out that there has been no catastrophic accident directly attributable to WFD since the Aloha Airlines accident in 1988 and that the National Transportation Safety Board found that WFD was a contributory factor, but not the sole factor, in that accident.

In contrast, Boeing commented that issuance of this final rule would cast a broad safety net on airframe structural performance for those types of details the industry has determined may be susceptible to WFD. Boeing said this final rule would provide for the establishment of safe operational limits and the maintenance actions necessary to preclude WFD prior to reaching those limits.

There have been several instances of major structural failure in flight due to fatigue. Therefore the potential for catastrophic structural failure is significant. The FAA considers that this rulemaking is essential to prevent future accidents or incidents. In the past, industry practice for new airplane design certification has been to develop some level of understanding of structural fatigue characteristics up to the design service goal, but not beyond it. A significant number of airplanes being operated currently have already accumulated a number of flight cycles or flight hours greater than the original design service goal. As the existing fleet continues to age, the number of such airplanes will increase. Structural fatigue characteristics of airplanes are understood only up to a certain point consistent with the analyses performed and the amount of testing accomplished. Operation beyond this point without further engineering evaluation should not be allowed because, in the absence of intervention, the likelihood of WFD increases with the airplane's time in service.

2. Existing Programs Serve Purpose of Rule

United Parcel Service, American Airlines, the CAA, ATA, Transport Aircraft Technical Services Company, and Lynden Air Cargo recommended that the proposed rule be withdrawn because existing programs serve the same purpose as an inspection program for WFD. These commenters were referring to existing elements of the Aging Aircraft Program, which resulted from the Aloha Airlines accident. They include the following:

- Supplemental Structural Inspection Program,
- Mandatory Modification Program,
- Repair Assessment Program,
- Corrosion Prevention and Control Program.

In addition, the FAA has issued airworthiness directives to address aging airplane safety concerns. Lynden Air Cargo and Transport Aircraft Technical Services Company said that the Aloha Airlines accident might not have happened if proper accomplishment and FAA oversight of the maintenance program had been performed.

The FAA recognizes that the four elements of the Aging Aircraft Program have some inherent ability to detect multiple site damage or multiple element damage, but existing inspection methods cannot detect such damage reliably. As acknowledged by some of the commenters, these four elements were not specifically designed to address WFD; they were designed as elements of an overall program to address structural degradation on the pre-Amendment 25–45 airplanes over 75,000 pounds maximum takeoff gross weight, commonly known as the "elite eleven." [15] This final rule, which specifically addresses WFD, is intended to be the last element of the overall Aging Aircraft Program.

The AAWG, of which several of these commenters were members, recognized the inadequacy of existing programs to address WFD when it submitted its recommendation for FAA rulemaking on this subject in 2001. The recommendation included the following discussion:

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

As discussed previously, the FAA has issued approximately 100 airworthiness directives to address unsafe conditions due to WFD on a number of airplanes. Airworthiness directives are reactive in the sense that the agency issues them only after determining that an unsafe condition exists in one or more airplanes and is likely to exist or to develop in other airplanes of the same type design. Typically, unsafe conditions associated with WFD or its precursors have been discovered largely by chance by people performing unrelated airplane maintenance.

The FAA concludes that the agency cannot rely on existing programs—including issuing airworthiness directives if the FAA learns of an unsafe condition—to detect or address WFD that occurs in aging airplanes. These programs do not obviate the need for a rule to prevent catastrophic accidents due to WFD. This final rule specifically addresses WFD and its precursors by requiring design approval holders to evaluate their airplanes for WFD to prevent development of unsafe conditions.

Although maintenance program oversight can always be improved, the

holders under this rule, this final rule makes those LOVs applicable to the affected airplanes, and § 91.403(c) requires operators to comply with them.

[15] The elite eleven are the original models considered under the Aging Aircraft Program. These were airplanes over 75,000 pounds, operating under part 121 or 129, that were at a greater risk for age-related structural problems because they had high-time airplanes that were near or over their design service goals. They include the Airbus A300, Boeing 707/720, Boeing 727, certain Boeing 737s, certain Boeing 747s, McDonald Douglas DC–8, DC–9/MD–80, and DC–10, Lockheed L–1011, Fokker F–28, and the BAC 1–11.

fact remains that WFD is difficult, if not impossible, to detect. Small cracks that can lead to WFD often cannot be detected until they suddenly increase in size and "link up," to cause catastrophic damage. Dramatic crack growth can occur quite suddenly and quickly, after being undetectable for long periods of time. That is why maintenance inspections cannot be relied on to detect and repair such cracking. Airplane maintenance programs include inspections that are designed to detect obvious damage and irregularities. WFD, by its nature, is usually hidden, and not readily detectable. Discovery of WFD in some airplanes by mechanics has been a purely random occurrence, where damage detected was the result of WFD that had progressed to the point of failure of structural members. An example is discovery of WFD on a Boeing 747, with adjacent frame cracking and separations. It was detected because of loose rivets on the skin. Mechanics happened upon the WFD damage by chance, because inspections had not uncovered any problem. Improving a maintenance program by adding or modifying inspections would not necessarily have the effect of improving detection of WFD. In general, the only way to address WFD is by modifying or replacing structure.

The National Transportation Safety Board report stated the following:

> It is probable that numerous small fatigue cracks in the lap joint along S–10L joined to form a large crack (or cracks) similar to the crack at S–10L that a passenger saw when boarding the accident flight. The damage discovered on the accident airplane, damage on other airplanes in the Aloha Airlines fleet, fatigue striation growth rates, and the service history of the B–737 lap joint disbond problem led the Safety Board to conclude that, at the time of the accident, numerous fatigue cracks in the fuselage skin lap joint along the S–10L linked up quickly to cause catastrophic failure of the large section of the fuselage.

The AAWG worked on various solutions to the safety problems encountered by aging airplanes and was instrumental in developing the four programs listed earlier in this document. However, they decided that additional actions were needed to preclude WFD in airplanes, and the steps they outlined included:

- Setting limits of validity of the maintenance program.
- Deciding whether WFD can be inspected for, and, if so, for how long such inspections would be effective.
- Defining when WFD-susceptible structure should be modified or replaced.

Lynden Air Cargo stated that it supported an approach that used airworthiness directives to address WFD-susceptible structural components instead of an LOV approach for the entire airplane. Lynden Air Cargo further stated that the unique design of the L–382G allows for the whole airframe to be renewed by replacing WFD-susceptible sections (*e.g.,* center wing and outer wing).

The FAA agrees with Lynden Air Cargo that WFD-susceptible structure can be replaced when the engineering data determines it should be replaced to preclude WFD. However, as airplanes age, other areas may also need to be replaced. The only way to determine that is to evaluate the engineering data (analyses, tests, service experience) for the entire airplane. Without the LOV, the operational life of an airplane is undefined. As a result, the list of areas to inspect, modify, replace, or any combination of these may be extensive, since the data would need to substantiate an indefinite life.

3. Divide Rule into Two

FedEx, Northwest Airlines, Continental Airlines, NACA, and ATA stated that the proposed draft final rule does not allow the public an opportunity to comment on the LOVs that design approval holders propose as compliance to part 26. They suggested the rule be divided into two rules: one for design approval holders and one for operators. The commenters noted that this two-step process would provide the public the opportunity to comment on design approval holders' proposed LOVs. Deferral of the operator rule would also allow for public comment on the WFD maintenance actions at the same time LOVs are established. In support of this approach, FedEx specifically argued that the incremental costs for the part 26 work to design approval holders is minimal, as design approval holders have confirmed in their comments to this docket.

The FAA has determined that complementary, concurrent requirements for design approval holders and operators are necessary to achieve the safety benefits of the proposed rule in a timely manner. Although design approval holders would be required to develop LOVs for affected airplanes under part 26, the safety benefit for this rulemaking initiative is not met until operators incorporate LOVs and only operate airplanes up to the point in time for which it can be shown that the airplane will be free from WFD. Until design approval holders actually comply with part 26, it's not possible to identify the precise LOV for any particular airplane. However, operators have had adequate general notice of the objectives of this rulemaking and the proposed methods for achieving those objectives in the form of the design approval holders' anticipated LOVs. Since the public meeting, both Boeing and Airbus have provided revised information about where they anticipate those LOVs will be set.

If additional, multiple rulemakings are necessary to require operators to incorporate LOVs into their maintenance programs, there is a risk of airplanes exceeding LOVs before those rules become effective. The FAA concludes that, to achieve our safety objectives, design approval holders and operators must have a shared responsibility on certain safety issues affecting the existing fleet. We also conclude, from reviews such as the Commercial Airplane Certification Process Study (March 2002), that we need to facilitate more effective communication of safety information between design approval holders and operators. As both technology and airworthiness issues become more complex, certain fleet-wide safety issues require the FAA to implement complementary requirements for design approval holders and operators, when appropriate.

C. Concept of Operational Limits

This final rule requires design approval holders to establish limits of validity of the engineering data that supports the maintenance program. The proposed rule would have required that design approval holders establish initial operational limits beyond which airplanes may not be operated. The initial operational limit would be based on the demonstration of freedom from WFD up to that initial operational limit.

Several commenters supported the concept of early detection of WFD for aging airplanes but opposed the requirement to establish initial operational limits beyond which the airplanes could not be operated. These commenters equated establishment of such limits with mandatory retirement of airplanes and suggested that, instead, the FAA enhance current maintenance programs and practices.

1. Requests for Requiring Maintenance Programs Instead

An aircraft leasing and trading company named AWAS recommended that an inspection-based maintenance program become mandatory as airplanes reach their design service goal or their operational limit. Lynden Air Cargo stated that there are better, less intrusive

methods to achieve early detection of WFD than the "application of onerous initial and extended operational limits." According to the commenter, these methods include proper establishment, accomplishment, and enforcement of current airplane maintenance programs, such as the maintenance programs required by parts 121 and 135. Lynden Air Cargo said it is continuously revising its Continuous Airworthiness Maintenance Program to include a design approval holder inspection program of Structural Significant Items and recommended structural service bulletins.

These commenters raise some of the same issues as did those who opposed the rule altogether. They suggest that current programs for aging airplanes or new maintenance programs to detect WFD—along with issuance of airworthiness directives when WFD is detected—would obviate the need for setting operational limits.

As stated in the NPRM, the structural fatigue characteristics of airplanes are only understood up to a point in time consistent with the analyses performed and amount of testing accomplished. Structural maintenance programs are designed with this in mind. The LOV is defined as the limit of the engineering data that supports the structural maintenance program and the current regulatory maintenance requirements of parts 121 and 129 do not require that WFD be specifically addressed.

Also as discussed previously, WFD cannot be detected reliably by existing inspection methods. Therefore, the FAA considers that WFD in existing airplanes needs to be proactively addressed by requiring design approval holders to use relevant engineering data to project the number of flight cycles or flight hours or both which the airplanes can accumulate without incurring WFD. The engineering data may include the evaluation and establishment of maintenance actions that address WFD.

2. Single Retirement Point for a Model

The Modification and Replacement Parts Association (MARPA) opposed a single, mandatory retirement age for airplanes because of the "vast differences possible between aircraft models, missions, and maintenance." In a similar vein, a company named Safair, which is based in South Africa, commented that the difference in structural integrity of aging airframes lies in their use and abuse during their lives and is largely dependent on the specific load factors to which the airframe is subjected. Safair added that the proposed rule may be based on inadequate technical evaluation of the actual operational experience, considering the number of older aircraft that have been safely operated well beyond the actual cycles listed in the proposed rule.

It is true that there may be differences between airplanes of the same model which reflect differences in use and maintenance by different operators. When manufacturers design an airplane, they consider the various ways it may be used, and they develop a "mission profile" to account for the different loads the airplane may be subjected to that must be addressed in their design. In setting the LOV, manufacturers will take this information into account, along with service experience of the particular airplane model and fatigue test evidence. The LOV must apply to an airplane model, because it is based on analysis of the service experience of the entire fleet of affected airplanes.

3. Potentially Adverse Effect on Safety

Lynden Air Cargo, MARPA, and the airplane leasing and trading company AWAS also suggested that mandatory retirement of airplanes may have an adverse effect on safety which has not been considered by the FAA. Specifically, AWAS envisioned that operators of airplanes approaching their operational limit may perform minimal maintenance on airframes to save money. MARPA said that mandatory retirement could have a negative influence on the degree and timing of safety-related investment, particularly as the aircraft nears its "throwaway years." The owner and operator may not intend to be unsafe, suggested MARPA, but the question "Why invest now?" will arise. A similar comment from Lynden Air Cargo anticipated that operators "are unlikely to apply the same level of maintenance effort for an airplane 1,000 flight hours from the scrap heap as one with 20,000 flight hours remaining."

Under existing operating rules, operators are responsible for maintaining their airplanes in an airworthy condition. These maintenance requirements apply equally to new and old airplanes. Even without this final rule, operators have always planned to retire airplanes, and service experience indicates that they generally continue to maintain them safely up to that point. The purpose of this final rule is to ensure that airplanes are retired before the point where they can no longer be safely maintained with respect to WFD.

D. Change in Terminology (Initial Operational Limit to LOV)

1. Rationale for the Term LOV

The NPRM proposed to establish an initial operational limit, expressed in flight cycles, flight hours, or both, beyond which an airplane could not be operated. Several commenters, including industry representatives on the AAWG and Boeing, objected to this term and suggested that instead the FAA refer to the "limit of validity of the engineering data that supports the maintenance program," or LOV. This final rule uses the term LOV to express the point beyond which an airplane cannot be operated (unless an extended LOV has been approved).

In recommending that the FAA refer to the "limit of validity of the engineering data that supports the maintenance program," or LOV, industry representatives on the AAWG stated that the term "initial operational limit" implies that the use of an airplane is limited in operation. According to the commenters, the limitation is actually based on the engineering knowledge of the structural behavior of the airplane model and is intended to ensure that required inspections are sufficient to ensure safe operations until a certain number of flight cycles or flight hours or both have been reached. The engineering data that support such inspection requirements change with time due to knowledge gained from in-service experience and additional testing.

Boeing defined LOV as the point (usually measured in flight cycles) in the structural life of an airplane where the engineering basis for the maintenance actions contained in the Airworthiness Limitations section of the Instructions for Continued Airworthiness is no longer a valid predictor of future structural behavior.

Our intent, as stated in the NPRM, was to ensure that large transport category airplanes not be operated beyond their initial operational limit, unless operators had incorporated an extended operational limit and the service information necessary to support it into their maintenance programs. Just as the structural fatigue characteristics of airplanes are understood only up to a point consistent with analyses performed, testing accomplished, and in-service experience gained, the engineering data used to develop inspections and modifications to preclude WFD is valid only to a certain point.

For these reasons, the FAA finds the term "limit of validity" more appropriate than the term "initial operational limit"

in defining the point to which an airplane may be safely operated in relation to WFD. The LOV is substantiated by test evidence and analysis. This test evidence and analysis may be augmented by service experience, or by service experience and teardown inspection results, if available. The service experience and teardown inspection results must be for high-time airplanes of similar structural design, accounting for differences in operating conditions and procedures. Additional engineering data would be necessary to support operation of an airplane beyond the LOV. The legal effect of the terms initial operational limit and limit of validity is the same. Therefore, this final rule uses the term limit of validity instead of the term initial operational limit.

2. Refer to the Structural Maintenance Program

Airbus stated that the term limit of validity of the engineering data that supports the maintenance program should be revised for clarification. Because WFD is addressed by performing inspections or modifications or replacements of airframe structure, the phrase "maintenance program" should be changed to "structural maintenance program."

The FAA agrees with Airbus and that change is reflected here.

E. Repairs, Alterations, and Modifications

This final rule requires design approval holders to establish LOVs for airplane models subject to this rule. However, it does not include separate requirements to address WFD for repairs, alterations, and modifications to those airplanes or to develop guidelines to address repairs, alterations, or modifications. The proposed rule would have required evaluation of repairs, alterations, and modifications of the baseline structure of the airplane. The proposed rule would have also required development of guidelines for repairs, alterations, and modifications. Persons repairing or altering airplanes certified to § 25.571 at Amendment 25–96 or later are already required to show the repair or alteration to be free from WFD up to the airplane's design service goal. This requirement has not changed since adoption of Amendment 25–96 in 1998.[16]

1. Whether Repairs, Alterations, and Modifications Pose WFD Risks

The Technical Document, discussed earlier, stated that the FAA, in response to comments, had removed the proposed requirements for repairs, alterations, and modifications. In response to the Technical Document, Lynden Air Cargo, Northwest Airlines, ATA, Continental Airlines, and FedEx stated that they support removal of requirements for repairs, alterations, and modifications from the draft final rule. These commenters stated that repairs, alterations, and modifications present a reduced risk for WFD because they will be surveyed and assessed under the Aging Airplane Safety Final Rule and the Damage Tolerance Data for Repairs and Alterations Rule (hereafter referred to as the Damage Tolerance Data Rule).[17] Commenters often used the term "Aging Airplane Safety Rule" to refer to the Damage Tolerance Data Rule or the Aging Airplane Safety Final Rule, or both. In instances where this occurs, to avoid confusion, the name of the specific rule has been inserted in parentheses.

These commenters expressed the belief that a new WFD requirement for repairs, alterations, and modifications is unnecessary because of these other requirements, which are already in place. Lynden Air Cargo stated that, although it supports removal of requirements to evaluate repairs, alterations, and modifications for WFD because the Damage Tolerance Data Rule already adequately addresses them, it does not understand how each design approval holder is going to establish the validity of its maintenance program without validating the repairs and alterations it has established under that program. Northwest Airlines said that it supported the conclusion of the AAWG that the costs of including repairs, alterations, and modifications in the rule outweighed the benefits that such a requirement would have.

Boeing, Airbus, and the European Aviation Safety Agency (EASA) said the FAA should reconsider its decision to remove from the rule the requirements for evaluating certain repairs, alterations, and modifications. All three commenters stated that removing those requirements could affect safety because certain alterations could affect the LOV and the structural maintenance program that supports the LOV. An example of an alteration that could affect the LOV and structural maintenance program, the commenter maintained, is one that would cause a global loading increase, such as an alteration allowing a higher cabin differential pressure. Airbus stated that, although the Changed Product Rule (14 CFR 21.101) may address future alterations and modifications, it does not cover existing ones.

Boeing recommended that the FAA revise subpart E of part 26, the Damage Tolerance Data Rule, for repairs and alterations, and §§ 121.1109 and 129.109, the Aging Airplane Safety Final Rule, to include requirements for evaluating repairs, alterations, and modifications for WFD. Boeing's recommendation contains two parts. First, it requests that the FAA extend the compliance date for both rules by 18 months after the effective date of the WFD rule. Second, it says the FAA should incorporate the 2007 ARAC recommendations on evaluating repairs, alterations, and modifications into those rules.

Boeing, Airbus, EASA, and the Allied Pilots Association (APA) stated that *certain* repairs, alterations, and modifications need to be evaluated for WFD. APA stated that eliminating the requirement to evaluate WFD associated with most repairs, alterations and modifications from the final rule is risky, because many high-time airplanes fall into this category and will not have any current analysis done on their modified airframes.

In its final report to ARAC concerning Task No. 3, the AAWG stated that it has reviewed the accident record and has observed that—while there is a technical possibility of a WFD-related accident involving a repair or alteration—there are no recorded accidents attributed to WFD occurring in properly-installed repairs or alterations. The group added that a review of certain repairs, alterations, and modifications is necessary, because some of them have the potential to develop WFD.

The FAA agrees with the commenters that some repairs, alterations, and modifications may pose a risk of developing WFD. However, the risk appears to be less than that for baseline airplane structure because all adverse service experience to date has been limited to baseline airplane structure. Type certificate holders design repairs, alterations, and modifications using the same design philosophies and load cases as for baseline airplane structure. As they do with the baseline airplane structure, type certificate holders re-evaluate their repairs, alterations, and modifications as service experience is gained. Therefore, these repairs, alterations, and modifications should be acceptable up to the LOV.

The repairs, alterations, and modifications developed by persons other than type certificate holders may present a slightly greater risk, because those persons typically do not have the

[16] March 31, 1998, 63 FR 15708.

[17] 72 FR 70486, December 12, 2007.

type certificate holder's data or expertise. Although those repairs, alterations, and modifications may pose a higher risk for developing WFD, there are no recorded accidents attributed to WFD occurring in these repairs, alterations, and modifications. Nor have there been a significant number of findings of multiple site or element damage associated with them.

The FAA is funding additional research at the agency's Technical Center to get a better understanding of these risks and how to address them.[18] This research includes conducting a field survey of repairs, alterations, and modifications on high-time airplanes to document the existing configurations. The research also includes removing some repairs, alterations, and modifications to further evaluate their condition. In some cases, testing of particular structure may be performed to obtain data for calibration and validation of methodologies for predicting WFD. If this research demonstrates that additional actions are needed to address risks for repairs, alterations, and modifications, the FAA will consider further rulemaking.

Based on the above, the FAA has re-evaluated the NPRM and determined that the proposed requirements to address repairs, alterations, and modifications should be removed from the final rule.

2. Relationship to Damage Tolerance Requirements (§ 25.571)

a. Pre-Amendment 25–96 Airplanes

The FAA received numerous comments requesting that the proposed requirements for repairs, alterations, and modifications in the NPRM and the related proposed requirements of the Damage Tolerance Data Rule NPRM[19] be combined and aligned in a single rulemaking. These commenters included industry representatives who are members of the AAWG,[20] the ATA, Boeing, Airbus, Cessna, and American Airlines. They were concerned that separate requirements for repairs, alterations, and modifications in the Aging Airplane Safety Rule (the Damage Tolerance Data Rule) and the NPRM for this rule would require duplicative efforts.

Given the proposed timeframes for compliance and the shortage of qualified industry resources to perform the required analyses, the commenters suggested that separate requirements are unnecessary and could not be accomplished within the proposed compliance times. The industry representatives on the AAWG stated that there are fewer than 50 persons in industry who are qualified to perform damage tolerance and WFD assessments and most of them are employed by the major design approval holders.

The AAWG stated in its final report on Task 3 that existing alterations and repairs would receive a damage tolerance assessment under the Aging Airplane Safety Final Rule (developed under the Damage Tolerance Data Rule).[21] The report indicated that this should provide an improved level of safety because repairs, alterations, and modifications would be surveyed and evaluated. The AAWG recommended that repairs not be re-reviewed for WFD if they had already been reviewed for damage tolerance.

Since adoption of Amendment 25–45 in 1978,[22] the damage tolerance provisions of § 25.571 have required consideration of damage at multiple sites, the precursor for WFD. While recent efforts on damage tolerance have focused on localized cracking, in most cases the design approval holders have addressed multiple site damage in their design of both baseline structure and of repairs, alterations, and modifications, even if indirectly. As a result, the FAA agrees that damage tolerance assessment of repairs, alterations, and modifications should provide some degree of mitigation of risk, even though the focus of the assessments has been on developing inspections, and inspections cannot reliably detect WFD.

The FAA recognizes the scarcity of expert resources in the area of damage tolerance and WFD. By removing requirements to address repairs, alterations, and modifications from this final rule, the agency is allowing those resources to be focused on meeting the compliance dates for the Damage Tolerance Data Rule and addressing WFD in baseline airplane structure, where the risks are greater. The FAA has recently been providing training to its designees and to industry members regarding compliance with § 25.571 and the Damage Tolerance Data and Aging Airplane Safety Final Rules. In that training, we have provided additional guidance on performing a damage-tolerance evaluation to assess damage at multiple sites. Adoption of this final rule should also result in significant commitments from industry to develop resources with this expertise.

b. Airplanes Certified to Amendment 25–96 or Later

The Technical Document described the agency's intent to remove requirements for evaluating repairs, alterations, and modifications for WFD. Airbus requested that the FAA clarify that today's final rule will not negate those requirements for persons making repairs, alterations, or modifications to their airplanes certified to Amendment 25–96. As another option, Airbus requested that the WFD rule applicability not include Amendment 25–96 or later airplanes, because those airplanes are already certified to WFD requirements.

The FAA agrees that clarification is necessary for airplanes certified to § 25.571, Amendment 25–96 or later. Amendment 25–96 revised § 25.571 to require that full-scale fatigue test evidence[23] be developed to show freedom from WFD up to an airplane model's design service goal. Also, any person performing a repair, alteration, or modification to those airplanes must address WFD for the repair, alteration, or modification, and show compliance with those requirements. The newest airplanes, like the Airbus A–380, are certified to Amendment 25–96, but most other airplanes operating today are certified to an Amendment level prior to 25–96, and thus would not be required to comply with those WFD requirements. They would, however, be required to comply with the requirements of the Damage Tolerance Data Rule.

For today's rule, § 25.571 and Appendix H to Part 25 require that applicants show an airplane model to be free from WFD up to the LOV instead of to the design service goal. Unlike Amendment 25–96, which did not require the design service goal to be included in the Airworthiness Limitations section, this final rule mandates LOV placement in the Airworthiness Limitations section. The

[18] Task Area II, Project I, Survey of Transport Airplane Structural Repairs and Alterations, Statement of Work 064070723–1, dated October 23, 2007; FAA William J. Hughes Technical Center, Atlantic City, New Jersey. The Scope of Work for this research is available in the docket for this rule.

[19] 71 FR 20574, April 21, 2006.

[20] The companies represented are Boeing, Airbus, American Airlines, Northwest Airlines, US Airways, United Parcel Service, FedEx, ABX (previously known as Airborne Express), Continental Airlines, Japan Air Lines, United Airlines, and British Airways. Although the comments are not representative of the views of other members of the AAWG, including national authorities, for simplicity the source of these comments is identified hereafter as "industry representatives on the AAWG."

[21] The Damage Tolerance Data Rule is Amendment 26–1 and the Aging Airplane Safety Final Rule is Amendment 121–337 to the CFR.

[22] October 5, 1978, 43 FR 46238.

[23] Test evidence comprises full fatigue testing up to at least two times the proposed design service goal and may include, for derivative airplanes, analysis, service experience, or service experience and results of tear-down inspections of high-time airplanes, if available.

requirements of today's rule are similar to those of Amendment 25–96. Any person who repairs, alters, or modifies any airplane certified under today's rule must show that repair, alteration, or modification to be free from WFD up to the airplane's LOV.

3. Guidelines for Repairs, Alterations, and Modifications

Industry representatives on the AAWG and several other commenters recommended that proposed § 25.1807(g), along with §§ 25.1809 and 25.1813, be withheld until the working group completed relevant taskings from ARAC. In particular, the commenters stated that the guidelines in § 25.1807(g)(3) could not be technically accomplished because the design approval holders do not have the data or knowledge necessary to provide guidance for all possible repair or alteration configurations.

Boeing and Airbus commented that they could support WFD guidelines that are limited in scope. The guidelines should identify structure prone to development of WFD and provide processes and procedures by which operators can access valid data for complying with the rule. But these commenters said that such guidelines should not attempt to describe methods for determining when WFD is likely to occur or for developing service information to preclude WFD. The commenters objected to providing guidelines as defined under proposed § 25.1807(g)(3) because design approval holders would have no control over how the guidelines would be used. They further stated that such guidelines could expose design approval holders to potential liability if they are applied incorrectly.

When the FAA issued the NPRM, the agency was relying on the AAWG, under an ARAC tasking, to identify a means of compliance that would be practical for both design approval holders and operators. Although ARAC did not provide detailed recommendations for developing guidelines, it did provide a general approach.

Requirements pertaining to repairs, alterations, and modifications were included in the proposed rule to ensure that they would not degrade the level of safety provided by the design approval holder's compliance with the rule. Although the FAA has removed these proposed requirements from the final rule, the agency is engaged with industry in a number of activities to address these concerns.

For repairs, the AAWG recommended in its final report on Task 3 that each design approval holder update its publications (*e.g.,* structural repair manuals, service bulletins, and repair assessment guidelines) to include instructions for inspecting and, if necessary, modifying structure susceptible to WFD. This update should occur by the time the design approval holder has established the LOV for an airplane model. The AAWG recommended that design approval holders update their service documents for WFD at the same time they are revising these documents for the Aging Airplane Safety Rule (the Damage Tolerance Data Rule) if the WFD data are available. The FAA expects that design approval holders will fulfill this recommendation. To the extent that design approval holders update their service documents for WFD, operators, when complying with requirements of the Aging Airplane Safety Final Rule by using those updated service documents for repairs, will be addressing the WFD risks for these repairs. In addition, § 25.571 already requires consideration of the potential for WFD for repairs to airplanes certified to Amendment 25–96 or later.

For alterations, the AAWG surveyed 642 supplemental type certificates. Out of the 642, they identified only 14 alterations and modifications that would require assessment for WFD. Based on this, they suggested that the FAA review these types of existing alterations to determine whether any action is necessary. The Task 3 report did not specifically recommend that design approval holders address their alterations for WFD. However, recent meetings conducted by certain design approval holders indicate that they intend to address their own alterations and modifications for WFD in addition to repairs in the Task 4 [24] structures task group activity. The majority of transport airplanes operating in the U.S. that are subject to this final rule will be addressed by these design approval holders. We anticipate that other design approval holders will also review their alterations and modifications for WFD.

While these activities will not address alterations and modifications developed by other persons (including supplemental type certificate holders), as stated earlier, the FAA is conducting research to get a better understanding of the risks that repairs, alterations, and modifications may pose for developing WFD and whether they need to be assessed for WFD. If the FAA determines that the risks are unacceptable, the FAA will consider further rulemaking to mandate assessments.

This research may also assist in refining means of compliance with § 25.571, at Amendment 25–96 or later, for repairs, alterations, and modifications. For airplanes certified to Amendment 25–96 or later, persons who repair or alter the airplane must address WFD. This has typically been done by showing the repair or alteration to be adequate up to the airplane's design service goal. With adoption of this final rule, repairs, alterations, and modifications to airplanes designed in the future will have to be shown to be free from WFD up to the airplane's LOV.

4. Rely on the Changed Product Rule

Northwest Airlines stated that it supports the FAA in removing WFD requirements for most repairs, alterations, and modifications, but requested that references to future alterations be removed from the final rule and addressed by the Changed Product Rule, 14 CFR 21.101. The Changed Product Rule requires that significant changes to type-certificated products comply with the latest amendments of the airworthiness standards unless one of the stated exceptions applies. In support of its position, Northwest Airlines cited concerns published by the AAWG about industry not having the resources or sufficient FAA guidance to accomplish WFD analysis for the expected quantities of supplemental type certificate alterations.

Similarly, ATA stated that in view of their coverage under the Changed Product Rule, the FAA should exclude future supplemental type certificate applications from the applicability of this rule. Northwest Airlines and ATA requested that the FAA use the Changed Product Rule to regulate which future alterations would need to be evaluated for WFD.

The Changed Product Rule would require applicants for future alterations and modifications to include the latest

[24] Task 4.—Model Specific Programs.

Oversee the Structural Task Group (STG) activities that will be coordinated for each applicable airplane model by the respective type certificate holders and part 121 and 129 certificate holders. These STG activities will involve the development of model specific approaches for compliance with §§ 121.370a and 129.16 under the guidance material supplied in Task 1. As part of this tasking, the AAWG will identify those airplane models that do not have an STG, and will assess the need to form one (based on industry benefit). For those airplane models that will need to form an STG, the AAWG will initiate the coordination required to form the STG with the respective type certificate holder and/or part 121 and 129 certificate holders. In addition, the AAWG will support implementation of the action plan to address recommendations made in tasks 2 and 3 as determined necessary by the ARAC, Transport Airplane and Engine Issues Group, and concurred with by the FAA.

amendment of part 25 for § 25.571 in the certification basis for the proposed alteration or modification if the change is considered significant. For the purposes of today's rule, applicants would use the examples of significant changes identified in AC 21.101–1. For transport category airplanes, that AC may be used as a starting point for determining whether alterations or modifications are significant and must be evaluated to the latest amendment of § 25.571. Examples of significant changes from AC 21.101–1 that would be required to be assessed for WFD include passenger-to-cargo conversions, gross weight increases, and cabin pressure increases. We have revised AC 25.571–1X to provide additional guidance for identifying whether a change, or structure affected by the change, requires an assessment for WFD. Affected structure can be new structure installed by the change or existing structure modified by a change. Structure may be affected if it is physically changed or if there is a change or redistribution of internal loads. The long-term result will be that a changed product will have a certification basis that provides a similar level of safety to that provided by the certification basis of a new type certificate for the same product.

F. Compliance Times for Developing and Implementing LOVs

For existing airplanes, this final rule uses a phased approach for establishing LOVs and divides the compliance dates for holders of design approvals and applicable airplane models into three groups. The NPRM proposed that design approval holders establish LOVs for all affected airplanes by one specific date. The proposed rule did not account for the age of airplanes within a model.

For this final rule, the compliance dates for the different airplane groups are identified based on their certification basis relative to § 25.571 and are as follows:

- *Group I:* Pre-Amendment 25–45 airplanes (those with a certification basis dating before 1978). The Boeing 727 and the Airbus A300 are examples of pre-Amendment 25–45 airplanes.
- *Group II:* Amendment 25–45 up to but not including Amendment 25–96 airplanes (those with a certification basis dating from 1978 to 1998). This group of airplanes would include the Boeing 757 and 767 and the Airbus A318.
- *Group III:* Amendment 25–96 and later airplanes (those with a certification basis dating from 1998 to the present). The Airbus A380 and the Embraer ERJ 170 and 190 are among the airplanes that have this certification basis.

Table 1 in § 26.21 indicates the compliance times for these various groups of airplanes. They are 18, 48, and 60 months, respectively. These compliance times apply to all existing versions of these airplane models.

For airplane models for which a type certificate is approved as of the effective date, but which are not specifically named in Table 1 of § 26.21, an LOV must be established within 60 months after the effective date of the rule. In Table 1 of § 26.21, those airplanes would fall under the category of "All Other Airplane Models Listed on a Type Certificate as of January 14, 2011."

For type certificate or amended type certificate approvals that are pending as of this final rule's effective date, and for future amendments to existing or pending type certificates, this final rule requires the applicants to establish an LOV by the latest of the following dates:

- Within 60 months after the effective date of the rule,
- The date a certificate is issued, or
- The date specified in the plan approved under § 25.571(b) indicating when the full-scale fatigue testing and evaluation will be complete.

This final rule requires operators to incorporate the Airworthiness Limitations section that includes the LOV into their maintenance program within 30, 60, or 72 months after the effective date for Groups I, II, and III, respectively. Table 1 in §§ 121.1115 and 129.115 gives the compliance times for operators.

This final rule also requires operators of affected airplanes whose applications for type certificates or amended type certificates are pending as of the effective date, or whose application for a type certificate or amended type certificate is made after the effective date of the rule, to incorporate the Airworthiness Limitations section that includes the LOV into their maintenance program at the latest of the following compliance times:

- Within 72 months after the effective date of the rule,
- Within 12 months after the LOV is approved, or
- Before operating the airplane.

In Table 1 of § 121.1115 and § 129.115, those airplanes would fall under the category of "All Other Airplane Models (TCs and Amended TCs) not Listed in Table 2."

Amended or supplemental type certificates that change the maximum takeoff gross weight are grouped separately. Holders of amended type certificates or supplemental type certificates that increase the maximum takeoff gross weight to greater than 75,000 pounds, regardless of whether such change was applied for before or after the effective date of the rule, must comply within 18 months after the effective date of the rule. Applicants for this type of design change approval whose applications are either pending as of the effective date of this final rule or submitted after the effective date must comply by the latest of the following dates:

- Within 18 months after the effective date of the rule,
- The date the approval is issued, or
- The date specified in the plan approved under § 25.571(b) indicating when the full-scale fatigue testing and evaluation will be complete.

Applicants for amended type certificates or supplemental type certificates applied for after the effective date of the rule that decrease the maximum takeoff gross weight to 75,000 pounds or less must also comply by the latest of the following dates:

- Within 18 months after the effective date of the rule,
- The date the certificate is issued, or
- The date specified in the plan approved under § 25.571(b) indicating when the full-scale fatigue testing and evaluation will be complete.

This final rule requires operators of airplanes whose maximum takeoff gross weight was decreased to 75,000 pounds or below after the effective date of the rule or increased to greater than 75,000 pounds at any time by an amended type certificate or supplemental type certificate to incorporate the Airworthiness Limitations section that includes the LOV into their maintenance program by the latest of the following compliance times:

- Within 30 months after the effective date of the rule,
- Within 12 months after the LOV is approved, or
- Before operating the airplane.

Those airplanes would fall under the category of "Maximum Takeoff Gross Weight Changes" in Table 1 of § 121.1115 and § 129.115.

Under 14 CFR 91.403(c), no person may operate an airplane unless that person is in compliance with applicable airworthiness limitations. By requiring operators to incorporate the Airworthiness Limitations Section containing the LOV into the maintenance program, this final rule makes those LOVs applicable to the affected airplanes, and § 91.403(c) requires operators to comply with them.

Operators of airplanes whose type certificate was pending approval as of the effective date of the rule will be required to include one of the following

airworthiness limitations in their maintenance program:

- The LOV that has been specified in the Airworthiness Limitations section of the Instructions for Continued Airworthiness; or
- If the LOV has not yet been established, a number equal to ½ the number of cycles accumulated on the fatigue test article if a type certificate is issued prior to completion of full-scale fatigue testing.

Comments received during the NPRM comment period were responding to the one specific compliance date published in the NPRM. Comments received during the comment period for the Technical Document, which described changes that had occurred to the rule since it had been proposed in the NPRM, were in response to the phased compliance dates published in the Technical Document, which are the dates cited in today's rule.

1. NPRM Compliance Date

Commenters—including industry representatives on the AAWG, Cessna, Continental Airlines, Embraer, AWAS, the CAA, American Airlines, Boeing, Airbus, and FedEx—objected to the proposed compliance date of December 18, 2007, for both technical and practical reasons. Several commenters stated that hard compliance dates and an expected final rule issuance in December 2006 would leave design approval holders with less than 12 months to comply with the subpart I requirements (now part 26). These commenters requested that the FAA revise the compliance dates to represent a number of months after the effective date of the rule rather than a hard date. This approach would prevent the FAA's schedule for issuing the final rule from affecting compliance by design approval holders.

We have revised the compliance dates in this final rule to specify that persons must comply either by a date determined as a specified number of months after the effective date of the final rule or (for applicants) by the date of approval of the related certificate.

2. When to Set LOVs for Existing Airplanes

Industry representatives on the AAWG, Boeing, Continental Airlines, Northwest Airlines, ATA, Lynden Air Cargo, and FedEx stated that there should be a phased approach to setting LOVs, with the oldest airplane models being addressed first. The industry representatives on the AAWG suggested that existing airplane models subject to the rule be divided into two groups: (1) Pre-Amendment 25–45 airplanes and (2) airplanes certified to Amendment 25–45 or later. The commenters stated that performing WFD evaluations on airplane models before the high-time airplane reaches its design service goal, as proposed in § 25.1807 (now § 26.21) and as specified in the Technical Document, would not significantly increase operational safety. This is because WFD is typically not a concern until later in an airplane's operational life. As discussed earlier, these commenters objected to the proposed compliance date of December 18, 2007. Commenters also objected to the compliance times identified in the Technical Document—that is, 18 months for pre-Amendment 25–45 airplanes, 48 months for Amendment 25–45 up to but not including Amendment 25–96 airplanes, and 60 months for Amendment 25–96 airplanes.

Boeing said that the final rule should provide the greatest amount of time for design approval holders to develop LOVs, so that LOVs provide the greatest flexibility for the fleet. Several commenters argued that requiring compliance prior to or concurrent with the Aging Airplane Safety Rule (Damage Tolerance Data Rule) would not be practical because of limited industry and FAA resources. In addition, Boeing and Northwest Airlines argued that establishing an LOV for an airplane model before significant service experience had been accumulated would result in an erroneous LOV.

We agree that it makes sense to have compliance dates for establishing LOVs for existing airplanes based on the relative safety risk (*i.e.,* addressing the oldest airplanes first) and on available resources. However, the agency does not agree that "early" establishment of an LOV will result in an "erroneous" LOV. Setting an LOV without benefit of significant service experience might result in an LOV that sets the limit at a lower number of flight hours or flight cycles than one that benefits from significant service experience, but it would be incorrect to characterize it as "erroneous." This is because the LOV is a function of the fatigue knowledge base available at the time it is established.

a. Pre-Amendment 25–45 Airplanes

Industry representatives on the AAWG, Boeing, Continental Airlines, Northwest Airlines, ATA, and FedEx pointed out that the first group of airplanes is collectively at the highest risk because of cumulative time in service and the limited fatigue test data available for these models. They recommended that the compliance date for the first group of airplanes should be by a certain date after the effective date of the rule. The AAWG's final report [25] recommends that LOVs be established for the first group of airplanes by June 2009, or 18 months prior to the operator's compliance date for the final rule, whichever occurs later. This would also provide sufficient time for Structures Task Groups [26] including operators of affected airplanes, to participate in establishing the LOVs. A later Boeing comment, however, requested that the compliance dates for those airplanes be 36 months, instead of 18 months (as stated in the technical document), from the effective date of the rule. Boeing stated that this additional time would allow them to have the FAA review and accept the Boeing proprietary LOV methodology, prepare LOV fleet proposals, and coordinate them within Boeing and with operators before submitting them to the FAA for review and approval.

The FAA agrees that pre-Amendment 25–45 airplanes should be addressed first because they are among the oldest airplanes and at the highest risk for developing WFD. In fact, most high-time pre-Amendment 25–45 airplanes have exceeded their design service goals. While the FAA understands that LOVs have been developed for a number of affected airplanes, the agency also understands that not all design approval holders have begun or completed this activity on all affected models. The FAA recognizes the benefits of allowing Structures Task Groups to participate in setting LOVs. Therefore, the FAA has determined that the compliance period for the oldest affected airplanes should be increased to 18 months to allow sufficient time for design approval holders to show compliance with today's rule. This increases by six months the amount of time design approval holders have to comply over what was anticipated in the NPRM. The 2007 AAWG Task 3 Report further supports the compliance date of 18 months. In its report, the AAWG stated that most of the work for the pre-Amendment 25–45 airplanes has already been completed. As a result, we do not concur with the commenter that 36 months is necessary to establish LOVs.

[25] Aviation Rulemaking Advisory Committee; Transport Airplane and Engine Issues—New Task, dated April 11, 2007.

[26] A Structures Task Group is a model-specific group that consists of type certificate holders and operators responsible for the development of aging airplane model-specific programs. It also includes regulatory authorities which approve and monitor those programs.

b. Airplanes Certified to Amendment 25–45 or Later

For the second group of airplanes (certified to Amendment 25–45 or later), industry representatives on the AAWG, Boeing, Continental Airlines, Northwest Airlines, ATA, and FedEx recommended setting a compliance date for design approval holders to establish LOVs that are tied to both the design service goal and the cumulative time on the high-time airplanes of that model. Specifically, the industry representatives on the AAWG proposed that within 180 days of the effective date of the rule, the type certificate holders provide design service goals for all affected airplane models to the FAA for approval. Once approved, these design service goals would be placed in an appropriate certification document. Other commenters—including Cessna, Continental Airlines, Embraer, AWAS, the CAA, American Airlines, Boeing, Airbus, and FedEx—agreed with industry representatives on the AAWG that the compliance date for setting LOVs should take into account both the design service goal and the cumulative time on the high-time airplanes of that model.

The industry representatives on the AAWG proposed that the design approval holder prepare a compliance plan with a binding schedule for a WFD evaluation when the high-time airplane reaches a point five years from its design service goal. The AAWG industry representatives suggested that a means of determining this time should be included in AC 120–YY. FedEx and Lynden Air Cargo suggested that the FAA use the design service goals that are being developed under the Damage Tolerance Data Rule to establish compliance dates for establishing LOVs and associated WFD maintenance actions. The commenters said that if no design service goal or design service objective exists, the LOV should be established when the high-time airplane of a particular model reaches 20 years of age.

In contrast, United Parcel Service and Technical Data Analysis, Inc. supported establishing LOVs for all affected airplane models as soon as possible, because of the uncertainty associated with estimating future operating costs and the length of time that airplanes can be operated.

The WFD risk for these newer airplane models is lower than for the pre-Amendment 25–45 airplanes because these airplanes are generally younger and have been certified to damage tolerance requirements. Therefore, the FAA agrees with the industry representatives on the AAWG and other commenters that the compliance times can be longer for these airplanes. On the other hand, the proposal of the AAWG industry representatives would add a level of complexity and uncertainty to determining compliance times that the FAA considers unnecessary and inappropriate and that would make operators' long-term planning difficult.

Therefore, as discussed earlier, to accommodate the need for a longer compliance time for these airplanes, this final rule creates three groups of airplane models for determining compliance dates.

- Group I—Pre-Amendment 25–45 (1978) airplanes.
- Group II—Airplanes certified to the requirements of § 25.571, Amendment 25–45, up to but not including Amendment 25–96 (1998).
- Group III—Airplanes certified to requirements of § 25.571, Amendment 25–96 or later.

Group II airplane models were all subjected to full-scale fatigue test programs. In addition, all the models in this group have been in service for a period of time. There should, therefore, be a reasonable knowledge base readily available on which to base an LOV. Today's rule requires establishment of an LOV for all these models within 48 months of the effective date of the rule, as indicated in Table 1 of § 26.21. This would allow design approval holders to schedule development of these LOVs after the more urgent development of LOVs for pre-Amendment 25–45 airplanes, so project schedules would not conflict. At the same time, this compliance time would ensure that LOVs are established long before the high-time airplanes of these models would reach their anticipated LOVs.

Design approval holders of those models in Group III have had to demonstrate or will have to demonstrate with sufficient full-scale test evidence that WFD will not occur within the design service goal of the airplane. Therefore, the design service goal would be a valid LOV that is based on the knowledge base considered. However, because these airplanes have not accumulated much time in service, there is less urgency in establishing an LOV. As a result, the final rule provides 60 months after the effective date of the rule to establish an LOV for these models. (*See* Table 1 of § 26.21.) This provides time to re-evaluate the fatigue data and to establish an LOV which may exceed the design service goal. Extending the compliance date for Group III airplanes beyond the compliance date for Group II airplanes reduces the resource concerns about developing LOVs for multiple airplane models at the same time.

Table 1 of § 26.21 includes a compliance date for airplanes that do not appear in the table but may have had a type certificate approved by the effective date. These have a compliance period of 60 months. Some type certificates are pending and may be approved shortly. This last row of the table is meant to capture any additional airplanes that fit the applicability criteria of § 26.21(a).

Table 1 of § 26.21 is used to call out existing airplanes and assign compliance dates. Holders of type certificates for these models must comply with § 26.21(c)(1). The remainder of § 26.21(c) specifies additional people who must comply.

Under today's rule, the compliance times specified in § 26.21(c) for when applicants must establish an LOV include the date specified in the applicant's plan for completion of the full-scale fatigue testing and analyses of the testing to demonstrate compliance with § 25.571(b).[27] All applicants who must comply with § 26.21 may use this date as one option for compliance.

Applicants who have the same compliance times and the option to use the date specified in the § 25.571(b) plan are:

- Applicants for type certificates for which the application is pending as of the effective date.
- Applicants for amendments to type certificates (with the exception of those that change the weight of the airplane).

All of these applicants are required to establish LOVs at the latest of the following dates:

- The date the type certificate or amended type certificate is issued,
- Within 60 months after the effective date of the rule, or
- The date specified in the plan approved under § 25.571(b) indicating when the full-scale fatigue testing and evaluation will be complete.

Among these applicants, WFD is of less immediate concern because their high-time airplanes will have accumulated relatively few flight cycles or flight hours by the compliance date. Establishing LOVs early in the service life of these airplanes will assist operators in their long-term planning. This approach also serves as a transition to § 25.571 as amended by this final rule, which requires establishing LOVs as part of initial type certification.

[27] Under § 21.17, these applicants are subject to § 25.571 at Amendment 25–96. In addition to this certification basis, they are subject to the requirements of this final rule.

Maximum takeoff gross weight changes to an airplane are treated separately in this rule. Holders of either supplemental type certificates or amendments to type certificates that increase maximum takeoff gross weights from 75,000 pounds or less to greater than 75,000 pounds must comply no later than 18 months after the effective date.

Applicants for supplemental type certificates or amended type certificates that increase the maximum takeoff gross weight to greater than 75,000 pounds must comply by the latest of the following:

- Within 18 months after the effective date of the rule,
- The date the certificate is issued, or
- The date specified in the plan approved under § 25.571(b) indicating when the full-scale fatigue testing and evaluation will be complete.

The option of 18 months after the effective date as a compliance choice for this group represents a six-month increase in the time to comply over what was originally proposed. We based these compliance dates on the length of time given for design approval holders of Group I airplanes to comply.

The NPRM did not specify a compliance time for applicants for design change approvals that, after the effective date of the rule, decrease the maximum takeoff gross weight to 75,000 pounds or less. This is because the applicability provision in the NPRM included airplanes with maximum takeoff gross weights exceeding 75,000 pounds, as approved during the original type certification. By referencing the capacity resulting from original type certification, the NPRM required applicants to establish LOVs for design change approvals that, after the effective date of the rule, decrease the maximum takeoff gross weight to 75,000 pounds or less. Although not explicitly stated in the NPRM, the LOV for those airplanes is required to be established by the compliance date for the original type certification or, in the case of applicants, by the date the approval of the design change has been issued. Because the NPRM was not clear about when those applicants must comply, the FAA has revised today's rule. Applicants for design change approvals that decrease the maximum takeoff gross weight to 75,000 pounds or less after the effective date of the rule must comply within 18 months after the effective date of the rule or by the date the certificate is issued or by the date specified in the plan approved under § 25.571(b), whichever occurs latest.

The FAA has also revised the compliance times to require those applicants who would decrease the gross weight of their airplanes after the effective date of the rule to submit a compliance plan within 90 days after the date of application.

3. Varying Implementation Strategies

APA suggested a way to address concerns about the time needed to develop an LOV. The commenter stated that the initial LOVs under consideration, as defined in the Technical Document, appear to be extremely liberal and based on limited data and minimal analysis. APA assumed that manufacturers would need more time to develop their analysis procedures, and said that a better approach for establishing the initial LOV would be to increase the design service goal by 10% to 15% and mandate inspections of high-time airplanes that are over their design service goal. APA based its suggestion on an assumption that the design service goals were based on hard test and engineering data. The commenter suggested halving the interval between maintenance checks for airplanes over their design service goal. Then, the commenter suggested, results of these inspections could be given to the manufacturer for use in substantiating the engineering WFD analysis. This data could be used to validate future incremental LOV increases.

Although this commenter maintained that design service goals are based on hard test and engineering data, that has not always been the criteria by which design service goals have been set. Amendment 25–96 to § 25.571 introduced requirements that applicants show freedom from WFD up to the design service goal. Prior to Amendment 25–96, however, there was no requirement for setting a design approval holder's design service goal or for validating it. Design approval holders have always used engineering data to substantiate their designs. Most design approval holders set design service goals for their airplanes, even though they were not required to do so. But since there were no requirements prior to Amendment 25–96 about what criteria must be used to set the design service goal, they have often been set for purposes driven more by sales and marketing than by engineering data.

Some design approval holders have stated that LOVs may be established at a point anywhere from 33% to 180% higher than the airplane's design service goal for certain models. This is because, for those design approval holders, there is a large body of in-service data to support these higher LOVs. Other design approval holders have taken an approach similar to APA's recommendation, in that they have been incrementally increasing their airplane model's LOV as the data supports it. Today's rule allows for an implementation strategy that provides flexibility to design approval holders in determining the timing of service information development (with FAA approval), while providing operators with certainty regarding the LOV applicable to their airplanes. However, no matter how the design approval holder chooses to manage LOV development, those LOVs must still be substantiated by engineering data.

4. FAA Review and Approval Time

Industry representatives on the AAWG, Boeing, Airbus, and CAA requested that the rule include required time periods for FAA review and approval activities. These commenters noted that the rules do not currently limit the amount of time the FAA will take to review and approve documents and that this will negatively affect their compliance time. Several commenters also noted that the amount of time the FAA will take to review and approve design approval holders' LOVs could reduce operator compliance time significantly.

We are not including required time periods for FAA review and approval of the required compliance activities. Instead, expectations for FAA personnel have been defined in FAA Order 8110.104, which directs the Aircraft Certification and Flight Standards Services in their roles and responsibilities for implementing these initiatives. The order includes expected times (6 weeks) for reviewing and approving design approval holder compliance plans, plans to correct deficiencies, and draft and final compliance data and documents. To facilitate implementation, the FAA will train affected personnel in their roles and responsibilities and provide in-depth familiarization with requirements of the regulations and associated guidance. Ultimately, however, the timing of FAA approvals will be determined by the quality of the design approval holder submissions and their responsiveness to issues raised by the FAA.

We have structured the requirements of the design approval holder rule and developed complementary guidance to facilitate timely review and approval of design approval holder submittals (such as compliance plans). An increase in operator compliance time would help ensure that operators are not affected by the FAA review and approval process. We have revised the WFD compliance

date for operators from 6 months to 12 months after the relevant design approval holder compliance date. This date is measured after the effective date of the final rule. As previously noted, for Group I, II, and III airplanes, the operator compliance dates are 30, 60, and 72 months, respectively, after the effective date of the rule.

G. LOVs for Future Airplanes: § 25.571, Appendix H, and Operational Rules

This final rule revises § 25.571 to require that—

- An LOV be established that corresponds to the time during which it is demonstrated that WFD will not occur in the airplane structure, and
- The LOV be included in the Airworthiness Limitations section of the Instructions for Continued Airworthiness required by § 25.1529.

Except for the change in terminology from initial operational limit to LOV, these revisions to § 25.571 are as proposed in the NPRM.

For operators of airplanes type certificated in the future, this final rule relies on existing operational rules to require operators to include the airplane's LOV, which is established under § 25.571 of today's rule, into their maintenance/inspection programs. This requirement is the same as that which was proposed in the NPRM.

1. Opposition to Changes to § 25.571

Industry representatives on the AAWG and Airbus commented that no change is needed to § 25.571 because airplanes certified to Amendment 25–96 must be free from WFD until they reach the design service goal, and the design service goal must be declared in the appropriate certification document.

We recognize that § 25.571 at Amendment 25–96 requires full-scale fatigue test evidence to demonstrate freedom from WFD up to the design service goal. However, the current regulations do not require that the Airworthiness Limitations section include the design service goal as an airworthiness limitation, so operators would be permitted to operate airplanes beyond this goal indefinitely. Therefore, the FAA finds it necessary to revise § 25.571, as proposed, to require that full-scale fatigue test evidence be used to demonstrate freedom from WFD up to the LOV and that the LOV be included in the Airworthiness Limitations section. These changes are consistent with recommendations made in 2003 by the General Structures Harmonization Working Group, a separate working group within ARAC.

2. Change to Appendix H

Under § 25.571, the FAA may issue a type certificate for an airplane model prior to completion of full-scale fatigue testing. As stated in the NPRM, the FAA did not propose to change this provision because the FAA intends that operators be able to operate these airplanes while the design approval holder is performing fatigue testing. Today's rule retains the requirement of § 25.571 that—if a type certificate is issued prior to completion of full-scale fatigue testing—the Airworthiness Limitations section must include a number equal to ½ the number of cycles accumulated on the fatigue test article. As additional cycles on the test article are accumulated, the number may be adjusted accordingly. This number is an airworthiness limitation, and no airplane may be operated beyond it until the fatigue testing is completed and the LOV is established.

For consistency however, the FAA has revised paragraph (a)(4) of H25.4 to part 25 (Appendix H) to include a reference to the limitation that an airplane may accumulate a number of cycles not greater than ½ the number of cycles accumulated on the fatigue test article until such testing is completed.

3. When to Set LOVs for Future Airplanes

Industry representatives on the AAWG, Boeing, and American Airlines commented that design approval holders should not be required to establish an LOV for a future airplane until the high-time airplane approaches its design service goal. United Parcel Service, on the other hand, recommended that the initial LOV be established during the initial certification process, and before the first airplane enters service. The ATA recommended that LOVs should be estimated at the time of airplane certification but should be reassessed when the high-time airplane approaches 75% of the estimate.

The LOV is a function of the fatigue knowledge base available at the time it is established. There should be sufficient data to establish an LOV for a new airplane model being certificated once full-scale fatigue test evidence is completed and assessed, normally several years after the airplane enters service. We agree that an LOV established for a new airplane model could be reassessed later when service information could be used with other data necessary to extend the LOV. Eliminating the requirement to address repairs, alterations, and modifications will simplify the process for extending the LOV.

The FAA does not agree that establishment of an LOV for a future airplane model should wait until the high-time airplane approaches its design service goal. As discussed previously, establishing design approval holder compliance dates that are a function of when high-time airplanes reach their design service goal would introduce a level of complexity and uncertainty to the requirements of the operational rules that is unnecessary and inappropriate.

One manufacturer is already employing the concept of establishing LOVs based on the fatigue knowledge base available through the certification process. Airbus has already included an LOV in the applicable Airworthiness Limitations section approved by EASA for all of its models with the exception of the A340.

4. Operational Rules

For airplanes whose type certificate application is made after the effective date of this final rule, LOVs must be established by the date the certificate is issued or the date specified in the plan approved under § 25.571(b). The LOV will be included in the Airworthiness Limitations section of the Instructions for Continued Airworthiness and will apply regardless of how or by whom the airplane is operated.

As discussed above, the FAA may issue a type certificate for an airplane model before full-scale fatigue testing has been completed. In that case, the Airworthiness Limitations section of the Instructions for Continued Airworthiness must include a number equal to ½ the number of cycles accumulated on the fatigue test article. Under § 91.403(c), operators may not operate these airplanes beyond this number of cycles. Once the fatigue testing is completed and the LOV is established and approved, operators may revise this airworthiness limitation to include the LOV. This LOV will be higher than the airworthiness limitation specifying ½ the number of fatigue test article cycles.

H. How to Set LOVs

Section 26.21(b) of this final rule requires design approval holders to establish an LOV of the engineering data that supports the structural maintenance program. This LOV corresponds to the period of time, stated as a number of total accumulated flight cycles or flight hours, or both, during which the design approval holder is able to demonstrate that WFD will not occur in the airplane. This demonstration must include an

evaluation of airplane structural configurations and be supported by test evidence and analysis. If available, service experience, or service experience and teardown inspection results, may be added to the test evidence and analysis to provide additional substantiation. The service experience and teardown inspections must be of high-time airplanes of similar structural design, accounting for differences in operating conditions and procedures.

The NPRM proposed in § 25.1807(b) [adopted here as § 26.21(b)] that holders of design approvals for existing airplanes subject to the rule be required to evaluate airplane structural configurations to determine when WFD was likely to occur for structure susceptible to multiple site damage or multiple element damage. The results of the evaluation were to be used to support establishment of an initial operational limit (now the LOV.)

The Boeing Company and industry representatives on the AAWG commented that proposed § 25.1807 would require an "evaluation" that is not adequately defined and that there are no objective criteria for establishment of an LOV. These deficiencies could result in establishment of an LOV based solely on analyses of structure susceptible to multiple site damage and multiple element damage, without consideration of more relevant and reliable data, such as test evidence and service experience. These commenters concluded that, in these circumstances, airplanes could be operated well past the point to which the engineering data supports safe operation.

The commenters recommended that the required evaluation explicitly include the following tasks, which are described in the AAWG's 2003 report [28] as necessary to establish or extend an LOV.

1. Ensure that the basics of the Aging Aircraft Program are in existence.
2. Collect data necessary to extend fatigue test evidence.
3. Perform analysis of the structure for multiple site damage and multiple element damage.
4. Create and update maintenance documents to include maintenance actions and modifications for those areas where it has been predicted that multiple site damage and multiple element damage will occur before the proposed LOV.

In addition, industry representatives on the AAWG and Boeing recommended that the rule explicitly use the term "fatigue test evidence" to refer to the collective body of information that should be considered in establishing an LOV. The FAA agrees that the first task, having basics of the four elements of the Aging Aircraft Program in place,[29] is an important element for continued safe operation out to LOV. However, as discussed in the NPRM, this final rule does not include requirements related to those initiatives because they are already mandated by airworthiness directives, operational rules, and airworthiness limitations.

The FAA considers that tasks 2 and 3 are implicit in the text of the proposed rule but agrees that proposed § 25.1807 could be misinterpreted and result in too much reliance on results of analysis to preclude WFD up to the LOV. This was not our intent. In fact, as discussed in the NPRM, our intent was consistent with the AAWG's recommendations regarding WFD.

In response to these commenters, the FAA has revised the proposed rule to clarify how the LOV is to be established. This final rule specifies that—for an LOV to be acceptable—the supporting evaluation must demonstrate that the fatigue characteristics and any specified maintenance actions for the airplane are sufficient to prevent WFD from occurring before the LOV.

The required demonstration typically involves an evaluation of the airplane structure to determine its susceptibility to WFD and, if the structure is susceptible, an evaluation indicating that WFD will not occur before the proposed LOV. The evaluation must be supported by test evidence and analysis. The design approval holder may augment the test evidence and analysis with any available service experience, or service experience and teardown inspection results of high-time airplanes. Service experience and teardown inspection results must be of airplanes of similar structural design and must account for differences in operating conditions and procedures. After seeing these changes to the rule as they were described in the Technical Document, Boeing stated that it supports the FAA's adoption of an airplane-level assessment of fatigue test evidence as the basis for both the determination and extension of LOV.

The FAA is using the term "test evidence" to align with the rule text of § 25.571 relative to WFD. Therefore, in the context of this final rule, test evidence is data derived from full-scale fatigue testing, which may be of the complete airplane, or of separate major sections of the airplane, or a combination of the two. The test evidence would be used to support the proposed LOV for an airplane model. The amount of test evidence required to show compliance would depend on where a design approval holder proposes to set an LOV and what data (such as test evidence or service experience) already exist.

For a new airplane model that is pending approval, there should be test evidence to address all WFD-susceptible structural areas of an airplane. The test duration should be at least two times the proposed LOV. The test evidence may be from prior full-scale fatigue tests performed by the applicant or others on similar structure. For derivative models, the applicant should compare the derivative model to the tested model. To use the test evidence from the original certification project or previous derivatives, the applicant should show that the derivative model does not significantly change the basic structural design concept, aerodynamic contour, and internal load distribution. Advisory Circulars 120–YY and 25.571–1X further describe considerations for when existing test evidence could be used.

For some older airplanes, fatigue test data may be limited to fuselage structure. This is because the pressurized fuselage has been considered to be the most fatigue-critical part of the airplane. The wing and empennage have typically been considered less critical and, as a result, relevant test data may not exist. However, for these same airplane models, significant service experience does exist. The FAA would accept a combination of test evidence and analysis as well as service experience as data to show compliance with this final rule.

For example, in the case of one of the pre-Amendment 25–45 airplane models, significant numbers of airplanes both in service and in storage have accumulated flight cycles in excess of the design service goal. For this model, there is significant existing test evidence for the fuselage, but very little for the wing. In this case, the FAA expects that demonstrating freedom from WFD for the wing would be based primarily on service experience; for the fuselage, it would be based primarily on service experience and test evidence. Advisory Circular 120–YY further describes considerations for when service experience could be used to supplement existing fatigue testing that is limited to certain major components of the airplane, such as the fuselage.

[28] AAWG, Widespread Fatigue Damage Bridge Tasking Report, July 23, 2003.

[29] Mandatory modification, corrosion prevention and control, supplemental structural inspection, and repair assessment.

The FAA has used the term "analysis" to include fatigue and damage tolerance analyses. Teardown inspections of in-service airplanes and fatigue test articles should be performed to the degree necessary to validate that the test evidence, analysis, and service experience are representative of the fatigue performance of the airplane out to the LOV. Design approval holders must explain in their certification plan how they intend to substantiate their proposed LOV. The FAA has revised AC 120–YY to provide further guidance on the steps to take for establishing an LOV.

As discussed in the NPRM, design approval holders are not required to identify and develop maintenance actions if they can show that such actions are not necessary to prevent WFD before the airplanes reach LOV. If they choose to establish LOVs that rely upon maintenance actions to prevent WFD before the LOV, they must identify those actions and, unless the necessary service information already exists, develop the service information in accordance with a binding schedule approved by the FAA. Those actions would then be mandated, not by today's rule, but by future airworthiness directives.

To be approved, the "binding schedule" for necessary maintenance actions must ensure that the service information is provided in a "timely manner." In the NPRM, the FAA explained that the purpose of this requirement was to enable the FAA to issue the necessary airworthiness directives in time to allow operators to accomplish these actions during normal maintenance. The intent is to allow design approval holders the flexibility to focus their efforts on initially developing service information on those maintenance actions that must be accomplished first. At the same time, the FAA expects design approval holders to devote sufficient resources to these efforts so that:

- The service information is available when the FAA needs it to initiate the airworthiness directive rulemaking process, including providing public notice and opportunity to comment; and
- The resulting airworthiness directives will provide sufficient compliance times so that the required actions can be accomplished without disrupting operators' normal maintenance schedules.

Airbus stated that the analysis is the driver for substantiating LOVs and that test evidence supports the analysis.

Analysis methods are used in combination with the engineering data to characterize WFD behavior to the degree necessary to determine if maintenance actions are required prior to the proposed LOV. As a result, test evidence and analysis are both required to demonstrate freedom from WFD. This is consistent with the existing requirements of § 25.571 at Amendment 25–96.

We agree that a design approval holder may not have both service experience and teardown inspection results available to use as part of its compliance data. We have modified the requirement so that a design approval holder may have either service experience or service experience and results of teardown inspections. The change is follows:

"This demonstration must include an evaluation of airplane structural configurations and be supported by test evidence and analysis at a minimum and, if available, service experience, or service experience and teardown inspection results, of high-time airplanes of similar structural design, accounting for differences in operating conditions and procedures."

I. How To Extend LOVs

Proposed § 25.1811 provided that any person could apply to extend an operational limit, using a process similar to that for establishing the initial operational limit. The configuration to be evaluated would consist of not only all model variations and derivatives approved under the type certificate for which the extension is sought, but also all structural repairs, alterations, and modifications to those airplanes, whether mandated by airworthiness directive or not.

Section 26.23(b) of this final rule (proposed as § 25.1811) contains requirements for obtaining approval of an extended LOV that corresponds to the period of time, stated as a number of total accumulated flight cycles or flight hours or both, beyond an existing LOV during which it is demonstrated that WFD will not occur in the airplane. This demonstration must include an evaluation of airplane structural configurations and be supported by test evidence and analysis at a minimum and, if available, service experience, or service experience and teardown inspection results of high-time airplanes of similar structural design, accounting for differences in operating conditions and procedures. Requirements for this section are the same as those for establishing an LOV. The FAA has removed the requirement to evaluate repairs, alterations, and modifications from § 26.23.

1. Change the Procedure for Extending LOVs

Industry representatives on the AAWG, ATA, Cessna, Airbus, United Parcel Service, FedEx, Boeing, and American Airlines stated that the means proposed in § 25.1811 for extending an operational limit is administratively difficult, impractical, and technically unachievable. The commenters expressed doubt that the proposed process could be realistically or uniformly accomplished because different operators will be involved in extending the LOV for the same airplane model. Furthermore, said the commenters, it is unlikely that any single operator has the information necessary to obtain an extended LOV. The cost, and uncertainty about the outcome of the evaluation, would make this process nearly impossible for an operator to attempt.

The commenters added that extending an LOV would need to be done by addressing each individual airplane, identified by tail number, whereas the maintenance actions which support the initial LOV are based on statistics pertaining to behavior of the entire fleet of a particular model. Thus, the method of determining maintenance actions to preclude WFD out to the LOV is not valid for a single airplane. The AAWG industry representatives recommended that establishing an extended LOV and evaluating repairs, alterations, and modifications be a sequential process. The first step would be to establish the extended LOV. The second step would be for each design approval holder for a modification to evaluate its own design relative to the extended LOV and obtain a separate, independent approval for its design. The operator would continue to be responsible for assembling all maintenance requirements, depending on actual airplane configuration, and for obtaining approval of the maintenance program from the principal maintenance inspector. Such a process is similar to industry proposals for compliance with the Aging Airplane Safety Final Rule.

Several commenters also remarked that the administrative process for obtaining an amended type certificate or supplemental type certificate will be extraordinarily difficult to manage because manufacturers, operators, and holders of supplemental type certificates do not necessarily have access to each other's proprietary information. The existing business and legal agreements in place did not contemplate the high degree of data disclosure that will be required to develop WFD guidance material and

data needed for an amended type certificate or supplemental type certificate. Furthermore, many transport airplanes are converted to operate in different roles than those for which they were originally designed. Often operators cannot obtain support or design data from design approval holders because the latter have concerns about liability, are no longer in business, or are more motivated to sell new airplanes than to support old ones.

Several commenters recommended that the FAA delete proposed § 25.1811 and revise proposed § 25.1807 to allow extension of an LOV by a process approved by the Administrator. They base their recommendation on the fact that the technical requirements for establishing an LOV are no different from those for establishing an extended LOV.

The FAA agrees that, given the extensive information required to develop guidelines for including a WFD evaluation of repairs, alterations, and modifications, the proposed requirements for extending the LOV needed to be changed. As discussed earlier, the FAA has removed those requirements. As a result, this final rule includes requirements for extending an LOV based on the original LOV airplane configuration plus all new structural modifications or replacements mandated by airworthiness directives. The FAA has revised requirements of § 26.23(b) to be consistent with § 26.21(b). As previously stated, if our research demonstrates that additional actions are needed to address risks for repairs, alterations, and modifications, the FAA will consider further rulemaking.

The FAA does not agree with the suggestions to allow extension of an LOV using a process approved by the Administrator. In this final rule, requirements for extending an LOV are similar to those for establishing the first LOV. However, the design approval holder is not required to develop the data to support an extended LOV because such extensions are optional. The extended LOV and associated maintenance actions (inspections, modifications, or replacements) must be defined within the Airworthiness Limitations section for the airplane. This requirement is unchanged from the proposed requirements of § 25.1811(b) of the NPRM. As stated in the NPRM, the FAA intends to use airworthiness directives to mandate any maintenance actions necessary to reach the LOV established under § 26.21, so that operators will have an opportunity to comment on the proposed maintenance actions. It is not necessary to use this process for extensions of the LOV, however, because the extended LOV would include all maintenance actions at the time of approval. For these reasons, the FAA has kept requirements for extending an LOV separate from § 26.21. The FAA has revised AC 120–YY to provide guidance on establishing an extended LOV.

2. Evaluation of Repairs, Alterations, and Modifications for an LOV Extension

EASA stated that certain existing repairs, alterations, and modifications should be evaluated for WFD when the LOV is being extended. EASA states that the risk of WFD increases for repairs, alterations, and modifications as airplanes age.

As discussed elsewhere in this document, an extension should be based on the airplane's structural configuration, just as the initial LOV is. Persons establishing extensions to LOVs may identify conditions or limitations in the Airworthiness Limitations section of the Instructions for Continued Airworthiness that apply to the extensions. For example, the LOV extension may only be valid for airplanes that operate at a certain cabin differential pressure or maximum takeoff gross weight. Operators may have to evaluate their airplanes and take certain actions prior to incorporating any extensions. AC 120–YY provides additional guidance on this.

3. Alternate Means of Compliance (AMOCs)

APA commented that operators should not be allowed alternate means of compliance (AMOCs) for the WFD rule because, it says, if the FAA allows AMOCs as it does with airworthiness directives, the ability to collect data and track compliance will be greatly complicated. Each operator, said the commenter, will comply in a manner with the least financial impact to its company. This may or may not be supported by the ongoing efforts of the original equipment manufacturers to develop analysis techniques and procedures. It will also add significant financial costs to the original equipment manufacturers and the FAA to support, track, and verify each AMOC.

The initial LOV is established and approved under § 26.21 or § 25.571. Any extension to the initial LOV or any subsequent LOV is established and approved under § 26.23. The FAA does not issue AMOCs for these regulations. Any deviation from a rule is handled via the procedures contained in 14 CFR part 11.

Under § 26.21, any maintenance actions needed to support the initial LOV will be mandated by airworthiness directives, and compliance with those airworthiness directives and the ability to apply for an AMOC for those maintenance actions will not involve procedures that are any different from those used for airworthiness directives today. An AMOC for the maintenance actions for an initial LOV will not affect the LOV itself.

Under § 26.23, however, any maintenance actions developed to support the extended LOV will be incorporated into the Airworthiness Limitations section of the Instructions for Continued Airworthiness. The maintenance actions for extended LOVs will not be published in airworthiness directives.

4. Extension Procedure Doesn't Allow Public Comment

ATA and Northwest Airlines stated that the proposed rule does not permit the public to comment on extensions to LOVs and the maintenance actions that support them. Extensions to LOVs mandated by airworthiness directive would allow the opportunity for public comments on extended LOVs.

Although mandating LOV extensions by airworthiness directive would allow the public the opportunity to comment, the FAA does not agree with the suggestions to use airworthiness directives to allow extension of an LOV. This is for two reasons:

- Approving an extended LOV isn't rulemaking; it's a finding of compliance with the applicable regulatory standard (*i.e.,* freedom from WFD).
- If the FAA doesn't extend the LOV, or subsequent extensions of that LOV, there's no unsafe condition justifying an airworthiness directive, because affected airplanes are grounded when they reach the LOV.

The FAA has revised AC 120–YY to provide guidance on establishing an extended LOV.

The AAWG recommended in its Task 3 Report that design approval holders and operators work together in establishing LOVs and LOV extensions. Under today's rule, the FAA expects that design approval holders and operators will work together when persons are seeking approval for extended LOVs.

J. Applicability for Existing Airplanes

The rule proposed in the NPRM would apply to existing transport category airplanes with a maximum takeoff gross weight greater than 75,000 pounds, by virtue of either the original type certification of the airplane or a later increase, that are operated under part 121 or 129.

This final rule applies to certain existing transport category, turbine-powered airplanes with a maximum takeoff gross weight greater than 75,000 pounds and a type certificate issued after January 1, 1958, regardless of whether the maximum takeoff gross weight is a result of an original type certificate or a later design change. In addition, it applies to transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958, if a design change approval for which application is made after the effective date of the rule has the effect of reducing the maximum takeoff gross weight from greater than 75,000 pounds to 75,000 pounds or less. It also applies to operators of those airplanes being operated under part 121 or 129.

1. Type Certificates Issued After January 1, 1958

As proposed, applicability of the rule was not limited to turbine-powered airplanes with type certificates issued after January 1, 1958. Everts Air Cargo requested that McDonnell Douglas Model DC–6 airplanes be excluded from applicability, and Boeing requested that both the DC–6 and DC–7 be excluded. Everts Air Cargo stated that its airplanes are non-pressurized, which should reduce the risk that they would develop WFD. Both Boeing and Everts pointed out that §§ 121.370a and 129.16 of the Aging Airplane Safety Final Rule apply only to certain transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958. The commenters recommended that the rule pertaining to WFD apply only to those same airplanes.

The FAA agrees that certain parts of the applicability of this final rule should align with the Damage Tolerance Data Rule and the Aging Airplane Safety Final Rule and other aging airplane rules, such as EAPAS/FTS. The McDonnell Douglas DC–6 and DC–7 airplanes have not had a damage tolerance assessment and have not been included in the Damage Tolerance Data Rule. In addition, the risk from excluding these airplanes is small because there are so few of them.

Therefore, in this final rule the FAA has added the phrase "transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958" to the applicability provisions of § 26.21 and to the operating rules. The change means that the following airplanes, which would have been affected by the proposal, are not subject to this final rule:

- McDonnell Douglas Models DC–6 and DC–7.
- Lockheed Model 1649A–98.
- Lockheed Model 1049 Series.
- Lockheed Models 49–46, 149–46, 649–79, 649A–79, 749–79, and 749A–79.

2. Original Type Certification

The applicability provision in proposed § 25.1807 included airplanes with maximum takeoff gross weights exceeding 75,000 pounds, as approved during original type certification, as well as airplanes with lower weights that had been increased to greater than 75,000 pounds through later design changes. This applicability provision was intended to address two situations. In the past, some designers and operators avoided applying requirements mandated only for airplanes over a specific capacity by receiving a design change approval for a slightly lower capacity. By referencing the capacity resulting from original type certification, the NPRM removed this means of avoiding compliance.

Similarly, an airplane design could be originally certified with a capacity lower than the minimum specified in the rule, but through later design changes, the capacity has been increased above this minimum. The reference in the NPRM to a later increase in capacity was intended to ensure that, if this occurs, the design would have to meet the requirements of the rule.

The applicability proposed in the NPRM did not distinguish among design changes based on whether their date of application for design approval occurred before or after the rule's effective date. That provision in proposed § 25.1807 is similar to that for the EAPAS/FTS, Fuel Tank Flammability, and Damage Tolerance Data Rules. In addition, the reference to capacity resulting from original type certification is common to proposed § 25.1807 and the other rules. The agency has determined that the approach to applicability under today's rule should be slightly different from that used in previous rules. This is to avoid requiring design approval holders to establish LOVs for models that have maximum takeoff gross weights that were decreased to 75,000 pounds or less by an amended type certificate or supplemental type certificate before the effective date of today's rule. Applicants for such design changes in the past could not have designed the airplanes' capacities to avoid complying with today's requirements, and it is not our intent to include them in the applicability of this final rule.

The FAA has revised this section (now § 26.21) to apply to transport category, turbine-powered airplanes with a maximum takeoff gross weight greater than 75,000 pounds and a type certificate issued after January 1, 1958, regardless of whether the maximum takeoff gross weight is a result of an original type certificate or a later design change. This section also applies to transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958, if a design change approval, for which application is made after the effective date of the rule, has the effect of reducing the maximum takeoff gross weight from greater than 75,000 pounds to 75,000 pounds or less.

The FAA has also revised the applicability of §§ 121.1115 and 129.115 to be consistent with the applicability of § 26.21 for existing airplanes. For future airplanes for which an LOV is approved in accordance with § 25.571 of today's rule, we have retained the requirement that §§ 121.1115 and 129.115 apply to operators of U.S.-registered transport category, turbine-powered airplanes, regardless of the maximum takeoff gross weight. For future design changes reducing the maximum takeoff gross weight from greater than 75,000 pounds to 75,000 pounds or less, the compliance date for operators is 30 months after the effective date of the rule, or the date of design change approval, or the date specified in the plan approved under § 25.571(b), whichever occurs latest. For these design changes, unless or until the design approval holder complies with § 26.21 by establishing a new LOV, the LOV applying to the airplane in the absence of the design change would still apply.

3. Airplane Configuration

This final rule requires that holders of type certificates for existing airplanes evaluate certain configurations of those airplanes for susceptibility to WFD and use the results of the evaluation to set LOVs for those airplanes. The configurations to be evaluated are:

- All model variations and derivatives approved under the type certificate, and
- All structural modifications and replacements to those airplanes which were mandated by airworthiness directives issued to address any configuration developed by the design approval holder.

In the NPRM, the FAA proposed evaluation of the same airplane configurations.

In their comments, the industry representatives on the AAWG, Boeing, and Airbus expressed concern about the proposed requirement to evaluate all structural modifications and

replacements mandated by airworthiness directives. Airbus stated that this approach deviates from all previous industry recommendations and will lead to a significant increase in configurations to be assessed. The industry representatives on the AAWG, Boeing, and Airbus requested that the FAA reconsider this requirement and focus only on airworthiness directives which have been issued specifically to address WFD.

The FAA issues many airworthiness directives which require structural modifications or replacements not intended to address WFD. These required modifications or replacements, however, may affect susceptibility of a structure to WFD. A modification might introduce new details that cause a structure which was previously not susceptible to WFD to become susceptible, or make a change that increases susceptibility so that previously established maintenance actions need to be modified. Because today's rule is intended to address the potential for WFD in airplanes as they are actually configured, we must address these required modifications. It would serve no useful purpose to evaluate structural configurations which no longer exist in service because airworthiness directives have required modifications to those configurations.

Modifications mandated by airworthiness directives are much fewer in number than other modifications, and they generally affect airplanes of the same model in the same way. Many modifications mandated by airworthiness directives would not affect the potential for WFD; others could.[30] Therefore, the FAA is today issuing this requirement as proposed.

4. Weight Cutoff

In the preamble to the proposed rule, the FAA stated that the agency had considered applying the rule to all existing transport category airplanes, regardless of the maximum takeoff gross weight. The FAA acknowledged that using a weight cutoff of greater than 75,000 pounds excludes approximately 1,600 regional jets operating under parts 121 or 129, giving the impression that this rule might not align with our "One Level of Safety" initiative. However, the FAA justifies the proposed weight cutoff on the basis of the relatively young age of the regional jet fleet. Because those airplanes are younger, they have a low present risk for WFD.

Embraer agreed that existing regional jet airplanes should not be subject to the rule at this time, stating that the airplanes have typically been certificated to damage tolerance requirements. Other commenters—such as the National Transportation Safety Board, Transport Canada, the Air Line Pilots Association (ALPA), EASA, and an individual commenter—did not agree, because the regional jets are at risk of developing WFD as they accumulate flight cycles just as larger airplanes are. The ALPA recommended that the FAA form a study group to assess WFD in lighter airplanes. Pending a detailed risk analysis, the association suggested a weight cutoff of 12,000 pounds.

The 75,000 pound weight cutoff was based on recommendations from the AAWG for WFD rulemaking. The overwhelming majority of passengers and cargo are carried by airplanes with a maximum gross takeoff weight of greater than 75,000 pounds. Inclusion of airplanes below that limit and above 12,500 pounds is under study by the FAA and if service experience shows a need to include those airplanes, rulemaking will be considered to include them.

The FAA's highest priority is to address the oldest airplanes at highest risk of WFD—namely, airplanes with a maximum takeoff gross weight greater than 75,000 pounds. However, the FAA recognizes that the lighter and relatively younger regional jets will also be at risk of developing WFD as they accumulate flight cycles. We will reassess the fleet, including those airplanes below 75,000 pounds, after this rule has been implemented, to determine whether further rulemaking is necessary.

5. Default LOVs and Excluded Airplanes

a. Table 1—Default LOVs

In the proposed operational requirements in the NPRM, the FAA inadvertently created an ambiguity regarding the obligations of operators of airplanes for which the design approval holder might fail to establish an LOV as required. While the FAA fully anticipates that affected design approval holders will comply with the requirements of this final rule, there is a need to clearly provide for what happens if one or more does not. As proposed, paragraph (a) of §§ 121.1115 and 129.115 would apply to operators of airplanes for which an LOV "has been established." Paragraph (b) of these sections requires that operators incorporate approved LOVs.

Our expectation was that, if a design approval holder failed to comply with the requirement to obtain approval for an LOV, the operator or operators, in order to continue to operate the affected airplanes, would themselves obtain the necessary approval. Because they would not have access to the design approval holder's data necessary to perform a WFD evaluation, they would likely have to rely on the design service goals and extended service goals set forth in Table 3 of the NPRM (*see* below). As stated in the NPRM, "After June 18, 2008, an affected operator could not operate an airplane unless the operator has incorporated an Airworthiness Limitations section approved under Appendix H to part 25 or § 25.1807 into its maintenance program."

The FAA now recognizes that the final rule should explicitly define operators' obligations if the design approval holder fails to comply. Therefore, the FAA has revised the operational rules to state that, in the absence of an approved LOV, the operator must incorporate the applicable LOV specified in Table 1 [31] of either § 121.1115 or § 129.115. The table also adds flight hour numbers for design service goals for airplanes for which that information was available.

The inclusion of default LOVs in Table 1 does not prevent an operator from developing its own LOV under § 26.23 of this final rule. The rule specifies that—

- The design approval holder must establish an LOV, and
- If an LOV is not approved, an operator must use the default LOV in Table 1. If an operator later chooses to establish an LOV under § 26.23, that LOV will be considered an extended LOV.

This provision eliminates any need for operators to obtain a separate approval for these "default" LOVs. It also eliminates the risk that a relatively young airplane would be grounded as of an operator's compliance date simply because the FAA had not approved an LOV for that airplane.

Boeing stated that the default LOVs published in the Technical Document are without context and could be misused. Boeing said that it could provide more appropriate numbers to

[30] Advisory Circular 120–YY provides guidance on which modifications mandated by airworthiness directives should be assessed by the design approval holder.

[31] To develop Table 1, the FAA added airplanes to Table 3, deleted airplanes from Table 3, and split Boeing Models 737, 747, and 777 airplanes into two groups. These airplanes were added: Airbus A318 and A380; Bombardier CL–600 (2D15 and 2D24); and Embraer ERJ–170 and ERJ–190. The following airplane models were deleted: Boeing 707 and 720; Bombardier CL–44 and BD–700; British Aerospace Airbus, Ltd. BAC 1–11; British Aerospace (Commercial Aircraft) Ltd. Armstrong Whitworth Argosy A.W. 650 Series 101; BAE Systems (Operations) Ltd BAe 146A (all models), Avro 146 RJ70A, Avro RJ85A, and Avro RJ100A.

use, but that these numbers should be removed from the rule because Boeing intends to comply with the rule.

The default LOVs in Table 2 of § 121.1115 and § 129.115 are intended to be used by persons who may choose to operate one of the excluded airplanes. They may also be used by other operators if a design approval holder is late in establishing an LOV, in order to prevent airplanes with fewer accumulated flight cycles and flight hours than the default LOV from being grounded. A few airplanes, such as the Airbus A380, already have an operational limitation included in their Airworthiness Limitations section. These are referenced in the table by a NOTE, and may be used as a default LOV.

FIGURE 3—COMPARISON OF NPRM DESIGN AND EXTENDED SERVICE GOALS AND FINAL RULE DEFAULT LOVS

Airplane model	NPRM table 3	Final rule §§ 121.1115 and 129.115 table 1
	Design and Extended Service Goals (flight cycles)	Default LOVs [flight cycles (FC) or flight hours (FH)]
Airbus:		
A300 B2 Series [32]	48,000	48,000 FC
A300 B4–100 Series [33]	40,000	40,000 FC
A300 B4–203	34,000	34,000 FC
A300–600 Series [34]	30,000	30,000 FC/67,500 FH
A310–200 Series (all models)	40,000	40,000 FC/60,000 FH
A310–300 Series (all models)	35,000	35,000 FC/60,000 FH
A318 Series (all models)	None provided	48,000 FC/60,000 FH
A319 Series (all models)	48,000	48,000 FC/60,000 FH
A320–100 Series (all models) [35]	48,000	48,000 FC/48,000 FH
A320–200 Series (all models) [35]	48,000	48,000 FC/60,000 FH
A321 Series (all models)	48,000	48,000 FC/60,000 FH
A330–200, –300 Series (except WV050 family) (non enhanced) [36].	40,000	40,000 FC/60,000 FH
A330–200, –300 Series WV050 family (enhanced) [36]	40,000	33,000 FC/100,000 FH
A330–200 Freighter Series	None provided	NOTE [38]
A340–200, 300 Series(except WV 027 and WV050 family) (non enhanced) [37].	20,000	20,000 FC/80,000 FH
A340–200, 300 Series WV 027 (non enhanced) [37]	20,000	30,000 FC/60,000 FH
A340–300 SeriesWV050 family (enhanced) [37]	20,000	20,000 FC/100,000 FH
A340–500, 600 Series (all models) [37]	20,000	16,600 FC/100,000 FH
A380–800 Series (all models)	None provided	NOTE [39]
Boeing:		
Boeing 707 (–100 Series and –200 Series)	20,000	Excluded per § 26.21(g)
Boeing 707 (–300 Series and –400 Series)	20,000	Excluded per § 26.21(g)
717 (all models)	60,000	60,000 FC/60,000 FH
Boeing 720	30,000	Excluded per § 26.21(g)
727 (all models)	60,000	60,000 FC
737 (Classics): 737–100, –200, –200C, –300, –400, –500 [40]	75,000	75,000 FC
737 (NG): 737–600, –700, –700C, 800, 900 [40]	75,000	75,000 FC
737–900ER	None provided	75,000 FC
747 (Classics): 747–100, –100B, –100B SUD, –200B, –200C, –200F, –300, –747SP, 747SR [41].	20,000	20,000 FC
747–400: 747–400, –400D, –400F [41]	20,000	20,000 FC
757 (all models)	50,000	50,000 FC
767 (all models)	50,000	50,000 FC
777–200, –300 [42]	44,000	40,000 FC
777–200LR, 777–300ER [42]	44,000	40,000 FC
777F	None provided	11,000 FC
Bombardier:		
CL–44D4 and CL–44J	20,000	Excluded per § 26.21(g)
CL–600: 2D15 (Regional Jet Series 705), 2D24 (Regional Jet Series 900).	None provided	60,000 FC
British Aerospace Airbus, Ltd.:		
BAC 1–11 (all models)	85,000	Excluded per § 26.21(g)
British Aerospace (Commercial Aircraft) Ltd.:		
Armstrong Whitworth Argosy A.W. 650 Series 101	20,000	Excluded per § 26.21(g)
BAE Systems (Operations) Ltd.:		
BAE 46 (all models) and Avro 146 RJ70A, RJ85A and RJ100A (all models).	50,000	Excluded per § 26.21(g)
Embraer:		
ERJ 170 (all models)	None provided	NOTE [43]
ERJ 190 (all models)	None provided	NOTE [44]
Fokker:		
F.28 Mark 70, Mark 100 (all models)	90,000	90,000 FC
Lockheed:		
300–50A01 (USAF C 141A)	20,000	Excluded per § 26.21(g)
L–1011 (all models)	36,000	36,000 FC
188 (all models)	26,600	26,600 FC

FIGURE 3—COMPARISON OF NPRM DESIGN AND EXTENDED SERVICE GOALS AND FINAL RULE DEFAULT LOVS—Continued

Airplane model	NPRM table 3	Final rule §§ 121.1115 and 129.115 table 1
	Design and Extended Service Goals (flight cycles)	Default LOVs [flight cycles (FC) or flight hours (FH)]
382 (all models)	20,000	20,000 FC/50,000 FH
1649A–98	20,000	Excluded per § 26.21(a)
1049–54, 1049B–55, 1049C–55, 1049D–55, 1049E–55, 1049F–55, 1049G–8249–46, 149–46, 649–79, 649A–79.	20,000	Excluded per § 26.21(a)
749–79, 749A–79	20,000	Excluded per § 26.21(a)
McDonnell Douglas:		
DC–6 [45]	20,000	Excluded per § 26.21(a)
DC–6A (all models) [45]	20,000	Excluded per § 26.21(a)
DC–6B (all models) [45]	20,000	Excluded per § 26.21(a)
DC–7 (all models) [45]	20,000	Excluded per § 26.21(a)
DC–8, –8F (all models)	50,000	50,000 FC/50,000 FH
DC–9 (all models)	100,000	100,000 FC/100,000 FH
MD–80 (all models)	50,000	50,000 FC/50,000 FH
MD–90 (all models) [46]	60,000	60,000 FC/90,000 FH
DC–10–10, –15 (all models)	42,000	42,000 FC/60,000 FH
DC–10–30, –40, –10F, –30F, –40F (all models)	30,000	30,000 FC/60,000 FH
MD–10–10F (all models)	42,000	42,000 FC/60,000FH
MD–10–30F (all models)	30,000	30,000 FC/60,000 FH
MD–11, –11F (all models)	20,000	20,000 FC/60,000 FH
Airplanes with Maximum Takeoff Gross Weight Changes:		
All airplanes whose maximum takeoff gross weight has been decreased to 75,000 pounds or below after January 14, 2011 or increased to greater than 75,000 pounds at any time by an amended type certificate or supplemental type certificate.	Design service goals and extended service goals for airplanes whose weight has been changed are unknown.	There are no default LOVs for airplanes whose weight has been changed.

[32] Listed as A300 B2–1A, B2–1C and B2K–3C in the NPRM.
[33] Listed as A300 B4–2C and B4–103 in the NPRM.
[34] Listed as A300 B4–600 Series, B4–600R Series, and F4–600R Series in the NPRM.
[35] Listed as A320 (all models) in the NPRM.
[36] Listed as A330 (all models) in the NPRM.
[37] Listed as A340 (all models) in the NPRM.
[38] Airplane operation limitation is stated in the Airworthiness Limitation section.
[39] Airplane operation limitation is stated in the Airworthiness Limitation section.
[40] Listed as Boeing 737 in the NPRM.
[41] Listed as Boeing 747 in the NPRM.
[42] Listed as Boeing 777 in the NPRM.
[43] Airplane operation limitation is stated in the Airworthiness Limitation section.
[44] Airplane operation limitation is stated in the Airworthiness Limitation section.
[45] Airplane certificated before 1958.
[46] Listed as MD–90–30 in the NPRM.

b. Table 2—Airplanes excluded from § 26.21

Section 26.21 specifically excludes models of airplanes from today's rule if no airplanes of that model are operating under part 121 or 129. Today's revisions to parts 121 and 129 requiring that operators incorporate LOVs into their structural maintenance programs include applicability to operators of airplanes that have been excluded under § 26.21 should the operator later decide to operate one of them.

In the NPRM, the FAA proposed excluding airplanes not operated under part 121 or 129. The agency proposed exclusion from the rule for:

- Bombardier BD–700.
- Gulfstream GV.
- Gulfstream GV–SP.
- British Aerospace, Aircraft Group, and Societe Nationale Industrielle Aerospatiale Concorde Type 1.

The FAA requested comments on the feasibility and benefits of including or excluding these airplanes. The agency also requested comments on the feasibility of including or excluding any other transport category airplanes with a maximum takeoff gross weight greater than 75,000 pounds from the requirements of this provision, whether or not they are operated under part 121 or 129.

Several commenters disagreed with the applicability of the rule, as proposed. The National Transportation Safety Board recommended that the final rule also apply to airplanes operated under part 135 because they may be at equal or greater risk of developing WFD compared to those operated under parts 121 or 129.

An individual commenter suggested that the FAA delete the list of airplanes proposed for exclusion because it gives preferential treatment to certain airplanes. This commenter added that an operator had planned to use Gulfstream GV airplanes for part 121 operations but chose not to do so only for financial reasons. If an operator did decide to operate an excluded airplane under part 121 or 129, said the commenter, there would be no operational limit and no associated maintenance actions to preclude WFD in that airplane. Although this commenter did not support having a list of excluded airplanes in the rule, he suggested—based on the agency's stated rationale in the NPRM—that we add the following airplanes to the list:

- The Douglas DC–6, DC–6A, and DC–7.
- The Lockheed 049, 149, 649, 749, 1049, 1649, 188, 300, and 382.
- The Boeing 707 and 720.

We have reconsidered our rationale for the list of excluded airplanes proposed in the NPRM. Those airplanes have a maximum takeoff gross weight greater than 75,000 pounds but are not currently operating under part 121 or 129. Therefore, there is no reason to require the design approval holders to establish LOVs for them. We have decided to retain on the list the models originally proposed for exclusion from the rule and, in response to comments, and to be consistent with other aging airplane rules, have added other models which are not operated under part 121 or 129. The complete list is shown below.

(1) Bombardier BD–700.
(2) Bombardier CL–44.
(3) Gulfstream GV.
(4) Gulfstream GV–SP.
(5) British Aerospace, Aircraft Group, and Societe Nationale Industrielle Aerospatiale Concorde Type 1.
(6) British Aerospace (Commercial Aircraft) Ltd., Armstrong Whitworth Argosy A.W. 650 Series 101.
(7) British Aerospace Airbus, Ltd., BAC 1–11.
(8) BAE Systems (Operations) Ltd., BAe 146.
(9) BAE Systems (Operations) Ltd., Avro 146.
(10) Lockheed 300–50A01 (USAF C141A).
(11) Boeing 707.
(12) Boeing 720.
(13) deHavilland D.H. 106 Comet 4C.
(14) Ilyushin Aviation IL–96T.
(15) Bristol Aircraft Britannia 305.
(16) Avions Marcel Dassault-Breguet Aviation Mercure 100C.
(17) Airbus Caravelle.
(18) D & R Nevada, LLC, Convair Model 22.
(19) D & R Nevada, LLC, Convair Model 23M.

The FAA recognizes that it is possible—as suggested by the individual commenter—that in the future an operator could decide to operate an "excluded" airplane under part 121 or 129. Therefore, in this final rule §§ 121.1115 and 129.115 are revised to provide that no airplane listed in § 26.21 can be operated under part 121 or 129 unless an LOV for the airplane has been incorporated into the operator's structural maintenance program. The operational rules state that, in the absence of an approved LOV, the operator must incorporate the applicable default LOV specified in Table 2 of either §§ 121.1115 or 129.115. Those default LOVs are based on Table 3 of the NPRM. As stated in the NPRM, Table 3 used design service goals and extended service goals that were based on information from design approval holders or on a conservative estimate by the FAA. It did not include the Comet 4C, IL–96T, Britannia 305, Mercure 100C, Caravelle, Convair Model 22, or Convair Model 23M. To develop those default LOVs, the FAA treated flight-cycle or flight-hour data that was available for those airplanes as fatigue test data and reduced it by a factor of two. This approach is based in part on AC 25.571–1X for new airplanes.

6. Bombardier Airplanes

Bombardier asked for clarification of the applicability of the proposed rule to several of its models and their derivatives. Specifically, the company asked about the following airplanes:

Models CL 600 Challenger 870 and 890: Bombardier asked whether they should be added to the list of excluded airplanes in proposed § 25.1807(i).

The CL 600 Challenger 870 and 890 do not currently have type certificates issued by the U.S. Therefore, there are no N-registered airplanes operating under either part 121 or 129. As a result, this final rule does not apply to them at this time. However, if Bombardier were to apply for a U.S. type certificate before the effective date of this final rule, the company would have to comply by the compliance date in § 26.21. Even if Bombardier were to apply after the effective date of the rule, the company would be subject to requirements of § 26.21 because the Bilateral Aviation Safety Agreements (BASA)[47] with Canada allow the U.S. to impose additional requirements in the interest of safety. Other airplanes in similar circumstances would be handled in the same way.

Model CL 600 derivatives—RJ 701 ER, RJ 701 LR, all RJ 705 airplanes, and all RJ 900 airplanes: Bombardier noted that Table 3 in the NPRM, titled Design and Extended Service Goals, does not list these models.

The CL 600 derivatives RJ 705 and RJ 900 were inadvertently left off Table 3 of the NPRM. This final rule applies to Bombardier models RJ 705 series and RJ 900 series because their maximum takeoff gross weight is greater than 75,000 pounds, and they are operated under part 121 or 129. They have been added to Table 1, which is the applicability table for this final rule. Today's rule does not apply to Bombardier RJ 701 series airplanes because their maximum takeoff gross weight is not greater than 75,000 pounds.

Model CL 44: These airplanes were previously exempted from the other aging airplane rules, both proposed and final, on the basis of their age and the very small number remaining in service.

Bombardier Model CL 44 is not operated under either part 121 or 129 and, therefore, the FAA has revised the list of excluded airplanes in § 26.21 of today's rule to include Bombardier Model CL 44.

7. Intrastate Operations in Alaska

Lynden Air Cargo requested that the NPRM pertaining to WFD be withdrawn in its entirety. Alternatively, the commenter requested that Lockheed Model 382 airplanes be excluded from the rule and that all air carriers engaged in intrastate operations in Alaska be excluded. In support of this request, the commenter gave the following reasons:

- There is no replacement airplane with the necessary lift and operational characteristics.
- The L–382 airplanes are not used to carry passengers.
- It is in the public interest to maintain the unique capabilities of the L–382 in Alaska where it supports remote communities and projects with no roads or waterways and supports the U.S. military during critical campaigns and the ongoing war on terrorism.

Lynden Air Cargo also asked that it be excluded from § 121.909.

Senator Murkowski of Alaska and the late Senator Stevens stated that the rule, as proposed, would have severe consequences to residents and cargo carriers operating in that State. Senator Stevens referred to Section 1205 of the Federal Aviation Reauthorization Act of 1996 (49 U.S.C. 40113(f)), which requires that—when modifying regulations affecting intrastate aviation in Alaska—the FAA consider the extent to which Alaska is not served by transportation modes other than aviation. Accordingly, Senator Stevens requested that the FAA exempt all intrastate operations in Alaska and the interstate operations of the six Lockheed L–382G airplanes operated by Lynden Air Cargo. The senator pointed out that the L–382G is out of production and there is no suitable replacement available.

Several other commenters addressed operational limits for Lockheed Models L–382E and G, although they did not discuss operation of these airplanes in Alaska. Specifically, Transafrik International asked that Lockheed Models L–382E and G be removed from Table 3 or that their operational limit be increased to at least 60,000 cycles. The commenter added that the airplanes are no longer in production and there is no

[47] Agreement between the Government of the United States of America and the Government of Canada for Promotion of Aviation Safety, June 12, 2000.

replacement airplane able to take off and land on short, unimproved runways with the payloads required. A comment from Lockheed Martin estimated—based on certain inspections and modifications which it had performed on the outer and center wing structure—that the LOV for the Lockheed Model L–382 is 50,000 flight hours but would no doubt be changed to at least 75,000 flight hours, to accommodate usage in the fleet. Lockheed Martin also identified maintenance actions that should be performed on the wing structure to operate to that limit. The commenter stated that, regardless of any FAA decision on implementation of the rule, the company will continue to ensure that operators of Lockheed Model L–382 model aircraft are provided with inspection procedures and replacement actions that effectively mitigate the risk of failure due to WFD.

Consistent with 49 U.S.C. 40113(f), the FAA has carefully considered the potential impact of this rulemaking on Alaska intrastate operators to determine whether intrastate service in Alaska would be adversely affected. Airplanes to which this final rule is applicable are not operated solely in intrastate commerce in Alaska. Therefore, contrary to the commenters' assertions, the FAA has determined that there would not be an adverse effect on intrastate air transportation in Alaska and that regulatory distinctions are not appropriate.

The Lockheed L–382G operated by Lynden Air Cargo is operated under 14 CFR part 121, Operating Requirements: Domestic, Flag, and Supplemental Operations and operates interstate as well as to foreign destinations. The FAA has decided against excluding the L–382G from requirements of §§ 121.1115 and 129.115 for those airplanes in interstate operation. The safety rationale for these rules applies equally to that airplane. In accordance with 14 CFR part 11, Lynden Air Cargo may submit a petition for exemption from those rules. Such a petition must state (1) why granting such an exemption would be in the public interest and (2) why a grant of exemption would not adversely affect safety or how it would provide a level of safety equivalent to the regulation.

Regarding Lynden Air Cargo's request for exclusion from § 121.909, that requirement, which was formerly designated as § 121.370(a), has been in effect since November 1, 2002.[48] The FAA has not made any changes to that rule other than changing its section number.

[48] 67 FR 72726, December 6, 2002.

The FAA encourages Transafrik and Lynden Air Cargo as well as other operators of Model L–382G to work with Lockheed Martin regarding the establishment of the LOV for the model.

8. Composite Structures

The Modification and Replacement Parts Association (MARPA) and Airbus asked that the FAA clarify applicability of the rule to structure made of composite materials, and MARPA recommended that composite structure should be treated the same as metallic structure.

There is an increasing trend for manufacturers to use composite materials to build airplanes. This structure wears differently than metallic structure. For example with metallic structure, repeated loads or environmental exposure cause fatigue cracking or corrosion. With composite structure, repeated loads or environmental exposure cause general degradation (such as cracking, delamination, and oxidative breakdown of the resin) and accumulation of local damage (such as wearing out of fastener holes and handling damage, or water ingression between composite layers, followed by freeze-thaw cracking of the core).

The FAA issued AC 20–107B to provide guidance for certifying composite structures, including guidance for evaluating composite structure relative to the damage tolerance requirements of § 25.571.

The objective of this final rule is to address the normal fatigue wear out of metallic structure. Although the trend in industry is to use composite structure as much as possible, a significant percentage of a new airplane may still be built of metal. Full-scale fatigue test evidence would be necessary to demonstrate that WFD will not occur in metallic structure of the airplane. It would also be necessary for the design approval holder for the airplane to develop an LOV to limit the operation to the point in time up to which it has been demonstrated that WFD will not occur in the airplane's metallic structure.

The FAA will continue to evaluate whether rulemaking is necessary to address the normal wear of composite structures.

K. Harmonization

A number of commenters, including industry representatives on the AAWG, FedEx, Boeing, Embraer, the National Air Cargo Association (NACA), AWAS, and Airbus noted that the WFD NPRM has not been harmonized with the European Aviation Safety Agency (EASA), which has issued Notice of Proposed Amendment (NPA) 05–2006 on this subject, and other national aviation authorities. The commenters pointed out that the Initial Regulatory Evaluation did not consider the cost of failing to harmonize the rule with other airworthiness authorities. Airbus also questioned whether the evaluation addressed costs associated with importing into the United States airplanes that have not complied with the rule, especially if the rule is not harmonized with other airworthiness authorities.

They recommended that the FAA harmonize the rule with those authorities before issuing it. According to the commenters, lack of harmonization could cause the following problems:

1. It could create a significant challenge to future certification projects, encouraging unilateral and possibly arbitrary certification activities.

2. There could be a substantial negative economic impact with respect to the transfer, lease, or sale of aircraft between the U.S. and other countries. Commenters suggested that bilateral agreements be amended to support the transfer of used aircraft subject to the final rule.

3. The FAA and EASA could have different approaches to WFD.

4. Type certificate holders from other countries may not be given the same priority and allocation of FAA resources as are type certificate holders from this country, resulting in delayed approval for applications from other countries.

Boeing, EASA, and Airbus requested that the FAA include the requirement to evaluate certain repairs, alterations, and modifications to align its requirements with those being proposed by EASA.

The FAA is working closely with EASA and other national airworthiness authorities to harmonize this final rule as much as possible. On April 25, 2006, EASA published NPA 05–2006, entitled Ageing Aeroplane Structures. That notice proposed technical guidance to be used for developing programs for continuing structural integrity, to ensure that the structure of aging airplanes is adequately maintained throughout their operational lives. Among other things, the notice proposed guidance for addressing WFD in existing airplane models. The FAA has provided comments on that proposed rulemaking. EASA is considering our comments and has discussed them with us.

Many of the changes made to our proposed rule will facilitate harmonization with national airworthiness authorities. Some of these changes are the following:

1. The design approval holder requirements proposed in the NPRM as part 25, subpart I, are now contained in a new part 26 to harmonize more easily with the regulatory structure of other national airworthiness authorities.

2. This final rule uses the term "limit of validity" rather than "initial operational limit" to align more closely with other national airworthiness authorities.

3. This final rule uses compliance dates that specify a phased approach for establishing the LOV for existing airplane models. NPA 05–2006 links compliance dates to design service goals. As discussed above, the FAA has concluded that the latter approach creates unnecessary complexity and uncertainty. We have submitted comments about this matter to EASA and are in discussions about it. In terms of establishing an LOV, the technical guidance in AC 120–YY is consistent with EASA's technical guidance in NPA 05–2006.

4. With respect to removal of requirements pertaining to repairs, alterations, and modifications, the FAA is working closely to harmonize this final rule with the rule EASA is developing but has not yet published for public comment.

5. Finally, the changes to § 25.571 are based on a recommendation of the General Structures Harmonization Working Group of ARAC. Development of the October 2003 recommendation pertaining to WFD involved harmonization between U.S. and European requirements.

L. The Regulatory Evaluation for the NPRM

The estimated present value cost of this final rule is about $3.6 million, while the estimated present value cost of the NPRM was estimated to be about $360 million. The estimated benefits of this final rule are worth $4.8 million in present value and are based on managing WFD with maintenance actions developed under this final rule versus the current practice of issuing airworthiness directives as WFD is found. The estimated present value benefits of the NPRM consisted of $726 million of accident prevention benefits and $83 million of detection benefits for total benefits of $809 million.

We received many comments regarding the validity of the regulatory evaluation of the proposed rule on WFD. In general, commenters stated that the potential benefits of the rule seemed to be overstated, and the potential costs seemed to be understated. Therefore, commenters challenged the conclusion that the benefits of the rule justify the costs. The commenters included Lockheed Martin, Boeing, Airbus, Bombardier, NACA, the CAA, ATA, FedEx, United Parcel Service, AWAS, American Airlines, Lynden Air Cargo, industry representatives on the AAWG, and an individual commenter.

1. Benefits of Proposed Rule

Some commenters questioned how a benefit of $726 million could be attributable to accident prevention when there have been no accidents related to WFD since the Aloha Airlines accident in 1988. The NACA and other commenters also argued that the regulatory evaluation makes a false assumption when it defines the cost benefit number for avoiding fleet grounding. Finally, the ATA and several other commenters suggested that projected benefits would decrease if the regulatory evaluation were updated to include data from the years 1974 through 1983 and 2000 through 2005.

Today's rule establishes a consistent approach to management of aging airplanes so that they are not operated to the point where WFD occurs. Thus the potential benefit of the rule is preventing catastrophic structural failure in flight that could result in loss of lives and loss of the airplane. Other benefits of the rule are costs avoided under the current system. Relying on the issuance of airworthiness directives to address WFD—whenever it happens to be discovered—causes unscheduled down time. The issuance of emergency airworthiness directives and immediately adopted rules may result in the unscheduled removal from service of a fleet of airplanes.

This final rule requires a design approval holder to establish an LOV for an airplane that reflects the fatigue characteristics of the airplane structure. If the WFD evaluation determines that maintenance actions are necessary to reach this LOV, the FAA would adopt them through the normal airworthiness directive process, allowing opportunity for notice and comment and accomplishment of required actions during scheduled maintenance. As such, the costs of these maintenance actions would be lower than if the FAA adopted emergency airworthiness directives or immediately adopted rules mandating the same actions as a result of in-service occurrences of WFD. As discussed below, the FAA expects very few airplanes to be retired solely because they reach their LOV. We have also taken this into account.

Our revised regulatory evaluation lists three benefits of the rule, namely

(1) Prevention of accidents;

(2) Extension of the economic life of the airplane with corresponding revenues from that additional economic life; and

(3) Near elimination of emergency airworthiness directives pertaining to WFD, which significantly reduces downtime associated with urgent unscheduled maintenance. The quantified benefit of the final rule is based solely on this third benefit, which is valued at $9.8 million or, evenly distributed over 20 years, a present value of approximately $4.8 million.

2. Costs of Proposed Rule

a. Need To Know LOVs To Determine Cost

Some commenters stated that, if the operational limit for each airplane model were not known, then the cost of the rule could not be determined.

In our Initial Regulatory Evaluation, the agency estimated the costs of initial operational limits to operators by using the design service goal for each airplane model as the initial operational limit. Those cost estimates would be expected to be higher than estimates based on LOVs that design approval holders anticipate establishing because in most cases, these LOVs are expected to exceed the design service goals. During the comment period, manufacturers provided the LOVs that they anticipate they will be establishing under today's rule. Those LOVs were 33% to 180% higher than the airplane's design service goal. Accordingly, our analysis in the Final Regulatory Evaluation uses these anticipated LOVs and indicates a lower cost to operators than was initially projected.

Airbus stated that not all of its models will have LOVs from 33% to 180% beyond the airplane's design service goal. Airbus will have LOVs for some models that will be equal to the airplane's design service goal. Although some of Airbus's LOVs are equal to the design service goal, which makes the LOVs span a shorter time, we still do not anticipate that any Airbus airplanes will need to be retired during the 20-year analysis period as a result of this final rule.

FedEx, Northwest Airlines, and ATA argued that operator cost estimates are not credible if they are based on anticipated LOVs instead of LOVs that have been accepted by the FAA and industry. It is for this reason that FedEx further argued that an operational rule must be proposed after the design approval holder's LOVs have been approved by the FAA. This would also, noted the commenter, provide the

public with the opportunity to comment on those LOVs.

The FAA measures the economic loss to operators of retiring an airplane at LOV instead of at a planned future retirement date. The FAA considers that this is a reasonable way to estimate compliance costs and that, ultimately, the LOVs that are accepted by the FAA and industry will be very close to those anticipated LOVs that the FAA has received from industry and used for these estimates of cost.

b. Need To Know Maintenance Actions To Determine Cost

Some commenters suggested that the costs associated with maintenance actions to preclude WFD prior to reaching the LOV either could not be determined or were substantially underestimated because the actions were not yet developed. Other commenters indicated that costs used in the regulatory evaluation do not accurately reflect operators' costs. They said, for example, that estimates of the number of hours needed to accomplish inspections, the number of inspections needed in a maintenance visit, and the number of days an airplane is out of service to accomplish maintenance did not reflect the actual experience of operators. Boeing added that the overall cost of the rule is difficult to determine because there will be costs related to maintenance actions required by airworthiness directives.

Although this final rule allows design approval holders to establish LOVs without relying on maintenance actions, the FAA expects most design approval holders will adopt LOVs that rely on such actions. As discussed in the NPRM, design approval holders are not required to identify and develop maintenance actions if they can show that such actions are not necessary to prevent WFD before the airplanes reach the LOV. As discussed in the Final Regulatory Evaluation, the FAA anticipates that at least Boeing will propose LOVs that will depend upon accomplishment of future maintenance actions. This is consistent with Boeing's current practice of developing service information that defines the maintenance actions to address WFD in its products. However, any maintenance actions necessary to reach the LOV will be mandated by airworthiness directives through separate rulemaking actions, so their costs are not attributable to this final rule. This is also consistent with the current practice of issuing airworthiness directives to address unsafe conditions associated with WFD. The FAA will provide cost estimates when issuing the airworthiness directives for any maintenance actions necessary to prevent WFD.

The FAA recognizes that this final rule is unusual in that it may depend upon future rulemaking to fully achieve its safety objectives. In the context of WFD, this approach is necessary to enable design approval holders to propose LOVs that allow operators the longest operational lives for their airplanes, while still ensuring freedom from WFD. This approach allows for an implementation strategy that provides flexibility to design approval holders in determining the timing of service information development (with FAA approval), while providing operators with certainty regarding the LOV applicable to their airplanes. The FAA has issued many airworthiness directives in the past to address WFD issues, and the agency anticipates that the approach adopted today will interface smoothly with existing practices for issuing airworthiness directives.

In this regard, this final rule is similar to SFAR 88, which also required design approval holders to perform technical evaluations (in that case, of fuel tank ignition sources) and to develop necessary maintenance actions that would be mandated by airworthiness directive. To date, the FAA has issued over 100 airworthiness directives to address unsafe conditions identified as a result of SFAR 88. These airworthiness directives were issued based on this proactive approach of requiring analyses to identify unsafe conditions, rather than relying on service experience to identify them, with potentially catastrophic results. In the context of SFAR 88, this approach has been generally recognized as being effective. The objective of this final rule is to establish a similar proactive approach that will enable us to issue any necessary airworthiness directives before WFD results in potentially catastrophic structural failure.

c. Costs to Manufacturers

Airbus indicated that, considering the significant number of hours necessary to train enough engineers and then to comply with the rule, the Initial Regulatory Evaluation substantially underestimated the costs of this rulemaking for manufacturers. Airbus said that the cost of future LOV extensions should be included. Based on further discussion to identify these costs, Airbus and the FAA agreed that Airbus currently meets the intent of today's rule by performing an evaluation of structure susceptible to fatigue and establishing an LOV prior to the development of WFD. The rule does not require manufacturers to extend LOVs—thus these extensions are not a compliance cost. The FAA does understand that LOV extensions are part of the existing Airbus business practice.

Boeing stated that the most significant costs will be borne by the manufacturer rather than the operator. When the manufacturer has to perform additional fatigue testing to substantiate an operational limit, said the commenter, the costs could be quite significant. Based on further discussion to identify these costs, Boeing and the FAA agreed that, because Boeing is also already engaged in the activities required by this final rule, its additional costs will be minimal.

A later Boeing comment, however, said that the regulatory evaluation summarized in the Technical Document, which was developed by the FAA for the public meeting, does not identify future expenses the Boeing Company will incur. Boeing believes this discounting is not correct because the company still has substantial work to do in providing maintenance programs for repairs and alterations, and in developing LOVs and supportive maintenance actions for post-Amendment 25–45 airplanes. Boeing said that the costs of an airworthiness directive are being attributed to operators, but do not account for manufacturers' costs. A second point made by this commenter was that certain LOVs may be set at a point lower than hoped, simply because the maintenance actions needed to bring that LOV out to a more distant point may be too technically difficult and costly to perform. This could result in a considerable amount of engineering work for Boeing to develop the LOV that, because the maintenance actions are never released, might not result in recompense for Boeing. Boeing said that we are presenting costs as either voluntary compliance for setting LOVs or as airworthiness directive costs for developing maintenance actions.

In discussions, Boeing has informed us that the company will voluntarily do this work to address WFD in its airplanes, with or without the rule. As a result, the rule does not impose costs, and the regulatory evaluation properly does not assign costs to Boeing's voluntary compliance. The rule does not require that design approval holders develop maintenance actions to be performed to support the LOV, nor does the rule require development of LOVs for repairs, alterations, and modifications. If the LOV developed by the design approval holder does specify maintenance actions, the FAA will separately estimate the costs of those

maintenance actions at the time as part of the airworthiness directive notice. Any work done on repairs, alterations, and modifications, because it is not required by the rule, is not accounted for as a cost of the rule. Compliance costs are assumed to be borne by the operators. If manufacturers have incurred costs in developing the maintenance actions for operators to reach LOV, there is nothing that precludes them from being recompensed for that work. The FAA based the analysis of costs in our Initial Regulatory Evaluation on discussions with the AAWG. Because this final rule is significantly different from the NPRM, the agency has re-evaluated these costs, and the results are reflected in the Final Regulatory Evaluation.

d. Cost of Failing To Harmonize Rule

Industry representatives on the AAWG, Airbus, Boeing, and the ATA pointed out that the regulatory evaluation did not consider the cost of failing to harmonize the rule with other airworthiness authorities. Commenters suggested that—if the rule were not harmonized—there would be a substantial negative economic impact with respect to the transfer, lease, or sales of airplanes between the U.S. and other countries. Commenters suggested that bilateral agreements be amended to support the transfer of used airplanes subject to this final rule.

As discussed in section III.K. above, the FAA is working closely with EASA and other national airworthiness authorities to harmonize this final rule as much as possible. Many of the changes to the proposed rule will facilitate such harmonization.

e. Cost To Replace an Airplane

A number of commenters said that the initial regulatory evaluation used replacement costs that are not accurate or justified. According to the ATA, "The assumptions used in the regulatory evaluation ignore the reality that some airlines replace their fleets with new aircraft in most cases, while others (particularly cargo carriers) depend on used aircraft with long remaining lives to support their particular business case." In a related vein, Airbus, the ATA, and an individual commenter said that the regulatory evaluation failed to consider the significant cost to operators of retiring airplanes. Of particular concern was the situation where airplanes that support an operation reach their operational limit, and there are no new airplanes which could fill the same role. The ATA said that the regulatory evaluation ignores factors that operators would take into account when deciding whether to retire an airplane or to seek approval of an extended operational limit but did not define those factors.

In the public meeting on December 11, 2008, a commenter representing United Parcel Service noted that the cost benefit analysis was based only on Boeing airplanes, and said that if the Airbus airplanes were included, there would be one airplane model with an LOV that is actually less than the design service goal in the original NPRM. United Parcel Service commented that operators of those airplanes would be interested in understanding how that economic impact to the residual value of those airplanes was not included in the cost. United Parcel Service also asked, since Boeing had expressed discomfort with the use of the anticipated LOV information that it had originally given the FAA, how the FAA could be comfortable using that information for the regulatory evaluation. Since the public meeting, Boeing has provided updated information about anticipated LOVs for their airplanes. Airbus has provided a table containing updated information on certain Airbus model LOVs and anticipated extensions to LOVs. The FAA uses this updated information in the Final Regulatory Evaluation.

Lynden Air Cargo said that the initial regulatory evaluation did not provide a true economic impact for either design approval holders or operators because it is based upon unknown facts from too few design approval holders and with no input from operators, who will bear 90% of the costs. Lynden Air Cargo provided flight cycle and flight hour data for its L–382G airplanes. Based on an LOV of 75,000 flight hours, Lynden Air Cargo stated that issuance of the "anticipated LOVs," which are included in the Technical Document, would require that Lynden Air Cargo immediately retire three of its six airplanes and, at the Lynden Air Cargo current utilization rate, retire the other three by approximately December 2019. Lynden Air Cargo estimates the cost to replace its six airplanes would range from $120 million to $810 million, if comparable airplanes were available.

Lockheed indicated that the LOV anticipated for the L–382 would be based only on flight hours. Based on flight hours, usage, and current ownership, we do not estimate that any L–382 airplanes will be retired in our 20-year analysis period. Lockheed stated that it will continue to support the L–382 model regardless of whether the FAA issues a WFD rule.

In developing the Final Regulatory Evaluation, the FAA used a commercial fleet data product that identifies the status of airplane hours and cycles. The FAA found only one U.S.-registered airplane currently operating under part 121 with a number of flight cycles exceeding the anticipated LOV for the airplane and only five U.S.-registered airplanes operating under part 121 that exceed 80% of those LOVs.

The economic cost of requiring retirement of an airplane at the anticipated LOV is a central issue in the cost estimate for today's rule. Common business practice is to value assets at the current market value, and the FAA follows this practice in the Final Regulatory Evaluation. In the case of airplanes at or near the end of their commercial lives, this value is quite small. Assigning a cost of purchasing a new airplane to replace an airplane at LOV would be a serious overstatement because it ignores the decline in value as airplanes age.

f. Residual Value of Airplanes

Several commenters, including the ATA, FedEx, United Parcel Service, Airbus, the CAA, Technical Data Analysis, Inc., and Celeris Aerospace of Canada, stated that the initial regulatory evaluation did not consider the impact of the proposal on loans, leases, and residual value of airplanes. They said the rule would have a particularly significant effect on cargo operations, which tend to use older airplanes.

These comments are based on an assumption that LOVs will be established at levels below where significant numbers of airplanes would otherwise be retired.

As discussed previously, the vast majority of airplanes are currently retired well before the LOVs that design approval holders anticipate establishing under this final rule. These retirements are for economic reasons unrelated to today's rule. The FAA expects that future retirement decisions will be made for similar reasons and that this final rule will force retirement of only one airplane that is otherwise reaching the end of its commercial operational life.

We use an appraiser-estimated airplane value when the airplane reaches LOV before retirement. This estimate properly reflects the true value of the asset. To include any other cost estimate would be double counting.

3. "Rotable" Parts

Northwest Airlines commented that it is not clear whether or not airplane life limits (the commenter's term for LOVs) extend to components, such as engine nacelles, passenger and cargo doors, flight controls, and wing-to-body fairings. These components can be

"swapped out," or rotated (they're known in the industry as rotable parts) from one airplane to another. Northwest Airlines said that there is a potential for significant costs associated with rotable parts if they are limited by an airplane's LOV. Operators typically do not track the number of accumulated flight cycles or flight hours for them. Northwest Airlines stated that operators may have to assume the flight cycles or flight hours on affected rotable parts to be equal to the world high-time airplane for that model. This may require that operators ground many airplanes or scrap rotable parts, resulting in significant costs that have not been captured in the regulatory evaluation included in the Technical Document.

The LOV is an airplane-level number. The FAA does not anticipate that rotable parts will be identified by design approval holders as structure susceptible to WFD. This is because the parts typically considered as rotable do not have structural details and elements that are repeated over large areas and operate at the same stress levels. AC 120–YY provides examples of structure in which multiple site damage or multiple element damage could occur. Rotable parts are not included in those examples. As a result, we have determined that rotable parts do not affect the cost of this final rule.

4. Use of LOVs for Financial Evaluations

Airbus expressed concerns similar to those expressed by Boeing and the members of AAWG about lack of uniformity in the manner in which various manufacturers are setting LOVs. The commenter also stated that it was important that the LOVs, and the LOV flight hour or flight cycle numbers, not be used by non-technical people in the finance community to set depreciation schedules, commercial valuations, comparisons, and competitive arguments. Airbus was concerned that such use of non-standardized data could lead to market distortion.

Airbus requested that we not publish LOV tables for each manufacturer's product lines in the rule and its preamble. It stated that this information would much more appropriately be published and updated in the manufacturer's Instructions for Continued Airworthiness for each airplane. Airbus suggested that, if the FAA nevertheless decides that publishing such LOV tables is necessary, then it would be important to develop, in concert with industry, the definitions, criteria, and methodologies to be used, so that resulting LOVs from all sources are consistent.

The FAA has revised the rule to ensure that there is an objective, performance-based standard for developing LOVs, and AC 120–YY has been updated to provide guidance in complying with those standards. The reason that design approval holders may appear to be arriving at different LOV numbers is largely a function of the age of their respective fleets. A design approval holder whose fleet is older will have a much larger body of service experience on which to confidently base an LOV. A design approval holder with a younger fleet might be more conservative when first setting an LOV, because there is not as much service experience data on which to base it. Another factor affecting how a design approval holder goes about setting an LOV is how much fatigue testing has been performed on a particular model.

The FAA appreciates that Airbus supports the intent of the WFD rulemaking, and understands Airbus' concern that LOVs could be misinterpreted by those who "set or approve" the economic life of an airplane. The FAA does not expect, nor intend, the LOV in the WFD final rule to set the economic life of an airplane. The March 18, 2009 edition of *Aviation Daily* reported that Airbus has extended the service goals of the A330–200 and A340–200 and –300. The purpose of publishing manufacturers' LOVs in the regulatory evaluation appendix is to provide clarity, transparency, and reproducibility for the economic analysis. As Airbus requested, the reason for the publication of LOVs is clarified in the Final Regulatory Evaluation. In the regulatory evaluation, the FAA states that it is important to note that manufacturers have changed LOVs based on updated information. Airbus, for instance, sets an initial LOV as a declared point for certification purposes. Periodically, as airplanes are shown to be viable for longer lives, design approval holders put programs in place to extend LOVs well before those utilizations are achieved. The FAA believes that manufacturers will continue this practice into the future and update their airplanes' LOVs. Thus the LOVs used in this regulatory evaluation should not be used as a basis for setting the economic life of an airplane. Based upon history, our estimated costs, which were based upon the current LOVs, may be overstated.

IV. Regulatory Notices and Analyses

Paperwork Reduction Act

The Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) requires that the FAA consider the impact of paperwork and other information collection burdens imposed on the public. According to the 1995 amendments to the Paperwork Reduction Act (5 CFR 1320.8(b)(2)(vi)), an agency may not collect or sponsor the collection of information, nor may it impose an information collection requirement, unless it displays a currently valid Office of Management and Budget (OMB) control number.

This final rule will impose the following new information collection requirements. As required by the Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)), the FAA has submitted these information collection amendments to OMB for its review. The Office of Management and Budget approved these new information collection requirements associated with this final rule and assigned OMB Control Number 2120–0743.

Title: Widespread Fatigue Damage.

Summary: Today's rule consists of regulatory changes pertaining to widespread fatigue damage in transport category airplanes. Some of these changes require new information collection. The new information requirements and the persons required to provide that information are described below.

(1) Amendment of part 26 requires that holders of design approvals for certain existing transport category airplanes establish limits of validity (operational limits) for those airplanes. Those design approval holders are also required to revise the Airworthiness Limitations section of the Instructions for Continued Airworthiness (ICA) to include the LOV.

(2) Amendment of part 26 also requires that design approval holders submit to the FAA a plan detailing how they intend to comply with the new requirements. The compliance plan ensures that design approval holders fully understand the requirements, correct any deficiencies in planning in a timely manner, and provide the information needed by the operators for timely compliance with the rule.

(3) Any person operating an airplane under part 121 or 129 is required to revise its maintenance program to incorporate an Airworthiness Limitations section that includes an LOV. Operators would be prohibited from operating an airplane past that limit.

(4) As an option, any person may apply for an extended LOV for affected airplanes. This option has requirements similar to those imposed on design approval holders for establishing an initial LOV. There may be service information developed that would

support the extended limit and would be documented as airworthiness limitation items. To operate beyond the initial LOV, an operator would have to incorporate the extended limit and any airworthiness limitation items pertaining to widespread fatigue damage into its maintenance program.

Use of Collected Information: These requirements support the information needs of the FAA in finding compliance with the rule by design approval holders and operators.

Average Annual Burden Estimate: The burden would consist of the work necessary to:

- Develop or revise the Airworthiness Limitations section of the Instructions for Continued Airworthiness to include the LOV.
- Develop the compliance plan.
- Incorporate the new information into the operator's maintenance program.

Today's rule results in the following annual recordkeeping and reporting burden:

FIGURE 4—RECORDKEEPING AND REPORTING FOR THIS RULE

Documents required to show compliance with the proposed rule	Total labor hours	Total average annual hours	Present value discounted ($2010) cost
FAA-approved revised or new ALS	660	132	$41,674
FAA-approved WFD compliance plan	435	* 435	33,418
FAA-approved maintenance program revision for operators	210	35	12,846
Total	1,305	602	87,938

* This one-time burden will occur in the first 90 days of the compliance period.

The FAA computed the annual recordkeeping burden (in total hours) by analyzing the paperwork needed to satisfy each requirement of the rule. The average cost per hour varies with the number of affected airplanes in each group, the amount of engineering time required to develop the LOV, and the amount of time required for revising the Airworthiness Limitations section of the Instructions for Continued Airworthiness. Other costs associated with the information collection requirements within this rule (in addition to the monetized hourly costs reflected above) are minimal.

In addition to the requirements outlined above, future applicants for either supplemental type certificates or amendments to type certificates that decrease or increase maximum takeoff gross weights would be required to develop a compliance plan for the certification project. The Paperwork Reduction Act compliance for development of these certification plans is covered by a previously approved collection (OMB Control Number 2120–0018) associated with part 21. We estimate the additional burden to include information on a plan for establishing an LOV for these airplanes would be minimal.

International Compatibility

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

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

This portion of the preamble summarizes the FAA's analysis of the economic impacts of this Final Rule. It also includes the final regulatory flexibility determination, the international trade impact assessment, and the unfunded mandates assessment. The FAA suggests readers seeking greater detail read the full regulatory evaluation, a copy of which has been placed in the docket for this rulemaking.

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

In conducting these analyses, FAA has determined this final rule has benefits that justify its costs, and is a "significant regulatory action" as defined in section 3(f) of Executive Order 12866 because it raises novel policy issues contemplated under that executive order. The rule is also "significant" as defined in DOT's Regulatory Policies and Procedures. The final rule, if adopted, however, will not have a significant economic impact on a substantial number of small entities, will not create unnecessary obstacles to international trade and will not impose an unfunded mandate on State, local, or Tribal governments, or on the private sector. These analyses, available in the docket, are summarized below.

Total Costs and Benefits of This Rulemaking

The overriding safety concern of today's rule is WFD-related incidents and accidents that have occurred and the continuing discoveries of WFD problems in the fleet. The current approach does not always find WFD before in-flight events occur. Today's rule will establish the necessary steps to prevent WFD in the future by requiring that design approval holders establish LOVs.

With this final rule, design approval holders may continue their work to provide maintenance actions that support the safe operation of airplanes up to LOV. The FAA would proactively issue airworthiness directives mandating those planned maintenance actions rather than reactively issuing emergency airworthiness directives and immediately adopted rules which

require unanticipated inspections and repairs. The FAA estimates that this approach is worth $4.8 million in present value.

In contrast to the NPRM, the final rule total costs are minor. Several significant factors are responsible for the reduction in these costs. First, the final rule does not include the repair, alterations, and modification requirement as in the NPRM. Second, many older airplanes have been retired since the NPRM. Third, due to the comments and conversations with design approval holders, the agency now understands that most LOVs will be set 33% to 180% higher than design service goal rather than at design service goal as was specified in the NPRM. Because of current maintenance programs and voluntary compliance by design approval holders, costs for design approval holders and operators are expected to be minimal. We anticipate that today's rule will result in one airplane retiring sooner than the operator would like, in contrast to the NPRM which predicted that many airplanes would retire sooner. Thus our base case model attributes the cost of this rule to the retirement of that one airplane, because it will reach the anticipated LOV within the 20-year analysis period. This will result in costs of $3.8 million, with a present value of $3.6 million.

Thus, as noted earlier, this final rule's expected present-value benefits of $4.8 million exceed the expected present-value costs of $3.6 million.

FIGURE 5—COMPARISON OF COST ASSUMPTIONS FOR NPRM AND FINAL RULE

NPRM assumptions	NPRM present value costs ($ millions)	Final rule assumptions	Final rule present value costs ($ millions)
Operator Retirement Costs • Initial Operational Limit (IOL) = Design Service Goal (DSG). • 27 airplanes would be retired in the first year of compliance. • Some IOL extensions.	160	Operator Retirement Costs • Limit of validity (LOV) > DSG for many models. • 1 airplane would be retired in the 20-year analysis period. • Few LOV extensions.	3.6
Operator Maintenance Program Costs • WFD maintenance actions[49] were included with extended operational limits. • We assumed some operators would perform maintenance actions.	164	Operator Maintenance Program Costs • With higher LOV, WFD maintenance actions may be necessary and would be mandated by ADs, per existing practice.[50] • Operators' costs to perform maintenance actions are included in cost of ADs.	0
Design Approval Holder (DAH) Costs Assumed 10% of entire costs.	36	DAH Costs Assumed minimal costs because DAHs are voluntarily developing LOVs and maintenance actions.	0
Total Costs	360	Total Costs	3.6

Who is potentially affected by this rulemaking?

• Design approval holders of transport category airplanes with a maximum takeoff gross weight greater than 75,000 pounds.

• Applicants for type certificates of transport category airplanes with a maximum takeoff gross weight greater than 75,000 pounds, if the date of application was before the effective date of the rule.

• Applicants for amendments to type certificates of transport category airplanes with a maximum takeoff gross weight greater than 75,000 pounds, with the exception of those that change the maximum takeoff gross weight of the airplane.

• Applicants or design approval holders for either supplemental type certificates or amendments to type certificates that increase maximum takeoff gross weights from 75,000 pounds or less to greater than 75,000 pounds.

• Applicants or design approval holders for either supplemental type certificates or amendments to type certificates that decrease maximum takeoff gross weight from greater than 75,000 pounds to 75,000 pounds or less after the effective date of the rule.

• Applicants for future type certificates, or for either supplemental type certificates or amendments to future type certificates, for all transport category airplanes, after the effective date of the rule.

• U.S. certificate holders and foreign air carriers and foreign persons operating U.S.-registered transport category airplanes under 14 CFR part 121 or 129 with a maximum takeoff gross weight greater than 75,000 pounds.

• Operators of any transport category airplanes certified in the future, regardless of maximum takeoff gross weight, if the date of application was after the effective date of the rule.

Our Cost Assumptions and Sources of Information

• Discount rate = 7%.

• Period of Analysis = 20 years.

• Value of fatality averted = $5.8 million (Source: U.S. Department of Transportation, *Treatment of Value of Life and Injuries in Preparing Economic Evaluations,* February 8, 2008).

• Aircraft Values = 2009 Avitas Blue Book of Jet Aircraft/Industry Consultation.

• Aircraft Fleet Data = OAG Associates Fleet Database.

Alternatives Considered

The FAA considered four alternatives to the proposed rule. These were:

1. Exclude small entities.

2. Extend the compliance deadline for small entities.

[49] Maintenance actions include inspections, modifications, and replacements. Because the extended LOV is not required, operators would have to decide to retire airplanes or perform the maintenance actions with the extended LOV.

[50] These ADs would be issued eventually, even without this rule, because WFD is inevitable and is an unsafe condition. More ADs may need to be written without this rule. If the necessary service information is not developed until after a finding of WFD in service, the resulting ADs are likely to include interim action requirements and have shorter compliance times, as compared with ADs issued based on service information developed as required by this rule.

3. Establish lesser technical requirements for small entities.

4. Expand the requirements To cover more airplanes.

1. Exclude Small Entities

The FAA concluded that excluding small entities from all the requirements of the proposed rule was not justified. The purpose of the proposed rule is to maintain the airworthy operating condition of airplanes regardless of secondary considerations.

2. Extend the Compliance Deadline for Small Entities

The FAA also considered options that would lengthen the compliance period for small operators. The FAA believes time extensions only provide modest cost savings and leave the system safety at risk.

3. Establish Lesser Technical Requirements for Small Entities

The FAA considered establishing lesser technical requirements for small entities. However, the FAA believes the risks are similarly unreasonable for small entities operating airplanes susceptible to WFD, and that the benefits of including small entities justify the cost.

4. Expand the Requirements To Cover More Airplanes

The FAA considered requiring all operators of existing transport category airplanes to comply with the proposed rule. However, the overwhelming majority of passengers and cargo are carried by airplanes with a maximum gross takeoff weight of greater than 75,000 pounds. The 75,000 pound weight cutoff was based on recommendations from the AAWG for WFD rulemaking. Because of this, the FAA decided to restrict compliance to operators of those airplanes.

The FAA concludes the current rule is the preferred alternative because it has benefits exceeding compliance costs and allows for continued operation of certain airplanes only up to the point where existing maintenance actions can no longer ensure that the airplanes are free from WFD.

Benefits of This Rulemaking

The non-quantified benefits include the safe (from WFD) operation of airplanes up to the LOV.

The lower-bound present value benefits of this final rule (the minimum value of a range estimate of benefits) are $4.8 million in present value. These quantified benefits are based on the near elimination of emergency airworthiness directives.

Costs of This Rulemaking

The total incremental costs of this final rule are approximately $3.6 million in present value from the costs of retiring one airplane.

Final Regulatory Flexibility Analysis

Introduction and Purpose of This Analysis

The Regulatory Flexibility Act of 1980 (Pub. L. 96–354) (RFA) establishes "as a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of the businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure that such proposals are given serious consideration." The RFA covers a wide range of small entities, including small businesses, not-for-profit organizations, and small governmental jurisdictions.

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

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

The FAA considers that this final rule will not result in a significant economic impact on a substantial number of small entities. The purpose of this analysis is to provide the reasoning underlying the FAA determination.

First, we will discuss the reasons why the FAA is considering this action. We will follow with a discussion of the objective of, and legal basis for, the final rule. Next, we explain there are no relevant Federal rules which may overlap, duplicate, or conflict with the final rule. Then we will discuss the substantial changes from the proposed to the final rule. Next, we will discuss the comments received about the Initial Regulatory Flexibility Analysis (IRFA). Lastly, we will describe and provide an estimate of the number of small entities affected by the final rule and why the FAA considers that this final rule will not result in a significant economic impact on a substantial number of small entities.

We now discuss the reasons why the FAA is considering this action.

The FAA is issuing this final rule to address the structural problems of aging airplanes known as "widespread fatigue damage" (WFD). WFD is characterized by the simultaneous presence of cracks at multiple structural locations that are of sufficient size and density that the structure will no longer meet its residual strength requirement and could catastrophically fail.

Past examples of WFD occurring in the fleet include:

- The 1988 Aloha 737 accident,
- An in-flight Lockheed Model L–1011 failure of aft pressure bulkhead stringer attach fittings,
- A McDonnell Douglas Model DC–9 aft pressure bulkhead cracks,
- Boeing Models 727 and 737 lap splice cracking,
- Boeing Model 767 aft pressure bulkhead cracking, and
- Boeing Model 747 and Airbus A300 frame cracking.

Because of these past incidents, accidents, and inspection discoveries and others, the FAA has already issued about 100 WFD-related airworthiness directives.

This final rule is being promulgated because the FAA believes the risk of an accident caused by WFD, and the potential collateral damage after such an accident, is too high without implementing today's rule.

We now discuss the objective of, and legal basis for, the final rule. Next, we discuss if there are relevant Federal rules which may overlap, duplicate, or conflict with the final rule.

Title 49 of the United States Code requires the FAA Administrator to consider the following authority:

- Assigning, maintaining, and enhancing safety and security as the highest priorities in air commerce. (49 U.S.C. 40101(d)(1).
- Aging Airplane Safety Act of 1991. (49 U.S.C. 44717).
- The FAA Administrator's statutory duty to carry out his or her responsibilities "in a way that best tends to reduce or eliminate the possibility or recurrence of accidents in air transportation." (*See* 49 U.S.C. 44701(c)).

Therefore, this final rule will amend Title 14 of the Code of Federal Regulations to require existing design approval holders to establish LOVs and operators of any affected airplane to incorporate those LOVs into maintenance programs of large transport

category airplanes with a maximum takeoff gross weight greater than 75,000 pounds, operating under 14 CFR part 121 and 129. These requirements will also apply to all applicants for type certificates after the effective date of the rule and operators of those airplanes. Today's rule does not require that any maintenance actions be performed to prevent WFD before an airplane reaches its LOV. Any maintenance actions necessary to reach the LOV will be mandated by airworthiness directives through separate rulemaking actions, so their costs are not attributable to this final rule.

This final rule will not overlap, duplicate, or conflict with existing Federal Rules.

We now discuss the changes from the proposed to the final rule and the reason the small entity determination in the Final Regulatory Flexibility Analysis (FRFA) has changed.

The FAA has made substantial changes to the WFD NPRM that significantly reduces costs to both small and large business entities. We have eliminated the requirement to evaluate WFD associated with repairs, alterations, and modifications of the baseline airplane structure, except for those mandated by airworthiness directives. This change dramatically reduces the economic impact of the NPRM's estimated compliance costs to small entity operators of part 25 airplanes. Also, in our request for comments, design approval holders responded by providing estimates of LOVs for their affected airplanes. In the NPRM we assumed the LOV will occur at an airplane's design service goal. Based on design approval holder comments LOV, in many cases, occurs anywhere from 33% to 180% beyond the design service goal, depending on the equipment model. An operator can now operate an airplane well past its design service goal and not incur the costs of making the decision to retire or extend the affected airplane's LOV until much later in the airplane's life. The only remaining cost is that we assume operators will retire their airplanes at LOV, rather than incurring the cost of the additional maintenance actions that may be needed for an extended LOV. With the scope of the rule reduced, both in terms of required inspections and in terms of affected airplanes, the economic costs of this final rule are much lower than the costs estimated in the NPRM and in the initial regulatory evaluation.

The FAA will now discuss the one comment received about the Initial Regulatory Flexibility Analysis (IRFA).

In the responses to the IRFA of the NPRM, we received a comment from Lynden Air Cargo. Lynden stated its L–382G airplanes were not included in IRFA. The commenter is correct. The Fleet data services consulted for the initial regulatory evaluation did not carry flight utilization data for L–382Gs, and the FAA was unable to determine the number of accumulated flight cycles or flight hours of Lynden's fleet in comparison to the anticipated LOV for those airplanes. Because of the lack of utilization data, Lynden's fleet was not included in our sample for the IRFA analysis. Lynden Air Cargo has since provided the FAA with utilization information for its L–382G fleet. Lockheed has provided an updated anticipated LOV for the L–382G fleet, based just in hours, and Lynden's entire fleet is below 80% of the LOV. With the base hours less than 80% of LOV, and with the current utilization rates of these airplanes, they will not reach LOV in the 20-year analysis time frame. Therefore the FAA expects no economic impact to Lynden Air Cargo in the analysis period for the final rule.

The FAA will now discuss the methodology used to determine the number of small entities for which the final rule will apply. The FAA will also discuss why the agency considers that this final rule will not result in a significant economic impact on manufacturers of part 25 airplanes.

For aircraft operators and manufacturers, a small entity is defined as one with 1,500 or fewer employees.[51] Since there are operators that met those criteria, the FAA conducted an economic impact assessment to determine if the rule will have a significant economic impact on a substantial number of these operators.

This final rule will become fully effective in 2010. Although the FAA forecasts traffic and air carrier fleets to 2030, too many factors are in play to estimate a future number of small entities, determine if an operator will still be in business, or determine whether that operator will still remain a small business entity. Therefore the agency will use the current U.S. operator's fleet and employment in order to determine the number and impact on small business entities this final rule will affect.

For analysis purposes, the FAA has divided the small entities that might be impacted by this final rule into two major classes, airplane manufacturers and air carriers.

[51] 13 CFR 121.201, Size Standards Used to Define Small Business Concerns, Sector 48–49 Transportation, Subsector 481 Air Transportation.

Currently, U.S. part 25 aircraft manufacturer type certificate holders include the following:

- The Boeing Company.
- Cessna Aircraft Company (a subsidiary of Textron Inc.).
- Raytheon Company.
- Gulfstream Aerospace Corporation (a wholly owned subsidiary of General Dynamics).

All United States part 25 aircraft manufacturers exceed the Small Business Administration small-entity criteria of 1,500 employees for aircraft manufacturers.

Air carriers potentially affected by the final rule include operators engaged in the following:

- Scheduled air transportation.
- Air courier service.
- Nonscheduled air transportation.

The FAA obtained the number of U.S.-operated airplanes having a maximum takeoff gross weight greater than 75,000 pounds from the OAG Associates Fleet Database (March 2009). This database identifies U.S. operators of affected airplanes by providing airplane age and flight utilization statistics. The FAA used the airplane flight utilization information in the analysis of small entity operator's airplanes affected by this WFD final rule. The FAA obtained annual operators' revenue and employment data from current public filings, the World Aviation Directory, and U.S. DOT Form 41 schedules.

Companies with greater than 1,500 employees were excluded from further analysis. Operators in Chapter XI bankruptcy were also excluded, since the outcomes of such proceedings are unknown. Lastly, we excluded all part 25 turbine-powered airplanes with a maximum takeoff gross weight of 75,000 pounds or less, or with a type certificate issued before January 1, 1958, because these airplanes are not affected by the final rule.

This procedure resulted in a list of airplanes, operated by U.S. operators with less than 1,500 employees, with a gross takeoff weight greater than 75,000 pounds. To this database were added airplane-specific design service goals, LOVs, and airplane residual value fields. The FAA used the design service goals published in the WFD NPRM and later updated them based on FAA and industry input. Manufacturers provided the LOVs. Airplane residual values were obtained from the 2009 Avitas Bluebook of Jet Aircraft and consultations with industry.

Next follows the discussion of the number of small entity operators with airplanes affected by the rule, and how

much it will cost for them to be in compliance.

Today's rule may cause airplanes to be retired, sold, or replaced sooner than an operator would like. Companies make decisions on the retirement, sale, or replacement of airplanes for many reasons. The decision point to sell, retire, or replace an airplane differs across companies. Operators take into account several key factors in their decision on when to retire an aircraft. The following are some of those key factors:

- Maintenance costs.
- Noise levels.
- Fuel consumption.
- Loss of consumer demand.
- Regulation changes.
- Shifting operator business plans.
- Operating costs.

Therefore, a company generally decides to retire, sell, or replace an airplane long before its LOV is reached. Given current airplane utilization rates, the FAA does not expect the final rule to affect companies below 75% of an airplane's LOV. When an airplane's flight utilization (measured in flight cycles or hours) exceeds 75% of LOV, the expectation is that the WFD provisions will become an increasingly important component of the decision to retire the airplane. All U.S. airplanes over 75% LOV currently operated by small business entities are in non-scheduled service. Many of these affected airplanes are being operated by cargo operators and hence have a lower utilization rate than their counterparts in scheduled passenger service.

The FAA discovered that 21 airplanes being operated by eight small entities were over 75% of LOV. For the 21 affected airplanes over 75% of LOV, the FAA analyzed utilization history reports by serial number. Results of this analysis showed that saying that 21 airplanes are over 75% of their LOVs overstates the number of airplanes affected by this final rule, because some of those airplanes listed as active have not accrued utilization statistics for years. The agency has identified 9 out of the 21 affected airplanes that have not accrued utilization for the past two years or longer. If the airplanes are not accumulating flight cycles or hours for years, then given the age of these airplanes, the FAA assumes that these airplanes are parked or retired.

This final rule will impose either the retirement of an airplane at LOV or a set of maintenance changes to extend the LOV for the airplane. In this final regulatory analysis, the assumption is that operators will retire the airplanes at LOV. The airplane retirement cost is the operator's most expensive economic choice based on compliance with the final rule.

The FAA's analysis determined that no small entities currently operate airplanes over 100% of LOV.

One small entity currently operates one airplane between 90–100% of LOV. Four small entities currently operate four airplanes between 80–90% of LOV. Lastly, the database lists four small entities operating seven airplanes between 75–80% of LOV. Table 1 shows these results:

Table 1

Number of Small Entitites & Their Airplanes Operating Near LOV

	Operators	Total Airplanes
Over LOV	0	0
90-100% LOV	1	1
80-90%LOV	4	4
75-80%LOV	4	7

To estimate when an airplane will exceed LOV, the FAA followed these steps: From the March 2009 OAG Associates Fleet database the FAA calculated the average age of U.S.-operated part 25 transport category retired airplanes over time. OAG defines a retired airplane as one that has been retired, scrapped or otherwise destroyed by its owner/operator at the end of the airplane's useful life. The FAA calculated the average age based upon the retired airplanes in the OAG fleet database beginning in the 1940s. On average, part 25 passenger airplanes were operated for 25 years and cargo airplanes were operated for 34 years, and then retired from U.S. service.

For the base case in the regulatory evaluation, the FAA assumed that in year 25 of operation, every affected passenger airplane will convert to cargo service and then retire from cargo service at 34 years. The FAA chose this scenario for the cost model because it captures nearly all of the affected airplanes.

The FAA applied these average ages to the affected airplanes in Table 1 and retired airplanes over the average retirement age of 34 years over the 20-year analysis interval used in the regulatory evaluation. Under this model, the agency assumes retirement of only one Boeing 747 airplane operated by a small business entity, because that airplane will reach its LOV before reaching its average retirement age.

The model estimates one small business entity will retire one airplane soon after the rule is promulgated. This small business entity will need to implement an appropriate WFD program, and either apply for an extended LOV or retire the airplane. For the FRFA, the FAA assumed the affected small entity will retire the airplane.

The FAA estimated the final rule's present value costs to the air carrier based on the 2009 Avitas Bluebook of Jet Aircraft residual value of the airplane forced to retire. The present-value residual value of the affected airplane is $3.6 million. The ratio of this present value cost to annual revenues is 1.28%. The FAA does not consider this impact to be economically significant, and since only one entity is potentially affected, this is not a substantial number of small entities.

The FAA Administrator certifies that this rule will not have a significant economic impact on a substantial number of small entities.

International Trade Impact Analysis

The Trade Agreements Act of 1979 (Pub. L. 96–39), as amended by the Uruguay Round Agreements Act (Pub. L. 103–465), prohibits Federal agencies from establishing standards or engaging

in related activities that create unnecessary obstacles to the foreign commerce of the United States. Pursuant to these Acts, the establishment of standards is not considered an unnecessary obstacle to the foreign commerce of the United States, so long as the standard has a legitimate domestic objective, such as the protection of safety, and does not operate in a manner that excludes imports that meet this objective. The statute also requires consideration of international standards and, where appropriate, that they be the basis for United States standards. The FAA has assessed the potential effect of this final rule and determined that it will impose the same costs on domestic and international entities and thus has a neutral trade impact.

Unfunded Mandates Assessment

Title II of the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4) requires each Federal agency to prepare a written statement assessing the effects of any Federal mandate in a proposed or final agency rule that may result in an expenditure of $100 million or more (in 1995 dollars) in any one year by State, local, and Tribal governments, in the aggregate, or by the private sector; such a mandate is deemed to be a "significant regulatory action." The FAA currently uses an inflation-adjusted value of $136.1 million in lieu of $100 million. This final rule does not contain such a mandate. The requirements of Title II do not apply.

Executive Order 13132, Federalism

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

Regulations Affecting Intrastate Aviation in Alaska

Section 1205 of the FAA Reauthorization Act of 1996 (110 Stat. 3213) requires the FAA, when modifying its regulations in a manner affecting intrastate aviation in Alaska, to consider the extent to which Alaska is not served by transportation modes other than aviation, and to establish appropriate regulatory distinctions. In the NPRM, the FAA requested comments on whether the proposed rule should apply differently to intrastate operations in Alaska. As discussed earlier, the FAA received comments on this subject from the late Senator Stevens, Senator Murkowski, and Everts Air Cargo and has determined that there would not be an adverse effect on intrastate air transportation in Alaska and that regulatory distinctions are not appropriate.

Environmental Analysis

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

Regulations That Significantly Affect Energy Supply, Distribution, or Use

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

List of Subjects

14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements, Continued airworthiness.

14 CFR Part 26

Aircraft, Aviation safety, Continued airworthiness.

14 CFR Parts 121 and 129

Air carriers, Aircraft, Aviation safety, Continued airworthiness, Reporting and recordkeeping requirements.

The Amendments

■ In consideration of the foregoing, the Federal Aviation Administration amends Chapter I of Title 14, Code of Federal Regulations, parts 25, 26, 121, and 129, as follows:

PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

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

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

■ 2. Amend § 25.571 by revising paragraphs (a)(3) introductory text and (b) introductory text to read as follows:

§ 25.571 Damage-tolerance and fatigue evaluation of structure.

(a) * * *

(3) Based on the evaluations required by this section, inspections or other procedures must be established, as necessary, to prevent catastrophic failure, and must be included in the Airworthiness Limitations section of the Instructions for Continued Airworthiness required by § 25.1529. The limit of validity of the engineering data that supports the structural maintenance program (hereafter referred to as LOV), stated as a number of total accumulated flight cycles or flight hours or both, established by this section must also be included in the Airworthiness Limitations section of the Instructions for Continued Airworthiness required by § 25.1529. Inspection thresholds for the following types of structure must be established based on crack growth analyses and/or tests, assuming the structure contains an initial flaw of the maximum probable size that could exist as a result of manufacturing or service-induced damage:

* * * * *

(b) *Damage-tolerance evaluation.* The evaluation must include a determination of the probable locations and modes of damage due to fatigue, corrosion, or accidental damage. Repeated load and static analyses supported by test evidence and (if available) service experience must also be incorporated in the evaluation. Special consideration for widespread fatigue damage must be included where the design is such that this type of damage could occur. An LOV must be established that corresponds to the period of time, stated as a number of total accumulated flight cycles or flight hours or both, during which it is demonstrated that widespread fatigue damage will not occur in the airplane structure. This demonstration must be by full-scale fatigue test evidence. The type certificate may be issued prior to completion of full-scale fatigue testing, provided the Administrator has approved a plan for completing the required tests. In that case, the Airworthiness Limitations section of the Instructions for Continued Airworthiness required by § 25.1529 must specify that no airplane may be operated beyond a number of cycles equal to ½ the number of cycles accumulated on the fatigue test article,

until such testing is completed. The extent of damage for residual strength evaluation at any time within the operational life of the airplane must be consistent with the initial detectability and subsequent growth under repeated loads. The residual strength evaluation must show that the remaining structure is able to withstand loads (considered as static ultimate loads) corresponding to the following conditions:

* * * * *

■ 3. Amend section H25.4 of Appendix H to part 25 by revising paragraph (a)(1) and adding paragraph (a)(4) to read as follows:

Appendix H to Part 25—Instructions for Continued Airworthiness

* * * * *

H25.4 *Airworthiness Limitations section.*

(a) * * *

(1) Each mandatory modification time, replacement time, structural inspection interval, and related structural inspection procedure approved under § 25.571.

* * * * *

(4) A limit of validity of the engineering data that supports the structural maintenance program (LOV), stated as a total number of accumulated flight cycles or flight hours or both, approved under § 25.571. Until the full-scale fatigue testing is completed and the FAA has approved the LOV, the number of cycles accumulated by the airplane cannot be greater than ½ the number of cycles accumulated on the fatigue test article.

* * * * *

PART 26—CONTINUED AIRWORTHINESS AND SAFETY IMPROVEMENTS FOR TRANSPORT CATEGORY AIRPLANES

■ 4. The authority citation for part 26 continues to read as follows:

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

■ 5. Revise § 26.5 to read as follows:

§ 26.5 Applicability table.

Table 1 of this section provides an overview of the applicability of this part. It provides guidance in identifying what sections apply to various types of entities. The specific applicability of each subpart and section is specified in the regulatory text.

TABLE 1—APPLICABILITY OF PART 26 RULES

	Applicable sections			
	Subpart B EAPAS/FTS	Subpart C widespread fatigue damage	Subpart D fuel tank flammability	Subpart E damage tolerance data
Effective date of rule	December 10, 2007	January 14, 2011	December 26, 2008	January 11, 2008
Existing [1] TC Holders	26.11	26.21	26.33	26.43, 26.45, 26.49
Pending [1] TC Applicants	26.11	26.21	26.37	26.43, 26.45
Future [2] TC applicants	N/A	N/A	N/A	26.43
Existing [1] STC Holders	N/A	26.21	26.35	26.47, 26.49
Pending [1] STC/ATC applicants	26.11	26.21	26.35	26.45, 26.47, 26.49
Future [2] STC/ATC applicants	26.11	26.21	26.35	26.45, 26.47, 26.49
Manufacturers	N/A	N/A	26.39	N/A

[1] As of the effective date of the identified rule.
[2] Application made after the effective date of the identified rule.

■ 6. Add subpart C to read as follows:

Subpart C—Aging Airplane Safety—Widespread Fatigue Damage

Sec.
26.21 Limit of validity.
26.23 Extended limit of validity.

Subpart C—Aging Airplane Safety—Widespread Fatigue Damage

§ 26.21 Limit of validity.

(a) *Applicability.* Except as provided in paragraph (g) of this section, this section applies to transport category, turbine-powered airplanes with a maximum takeoff gross weight greater than 75,000 pounds and a type certificate issued after January 1, 1958, regardless of whether the maximum takeoff gross weight is a result of an original type certificate or a later design change. This section also applies to transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958, if a design change approval for which application is made after January 14, 2011 has the effect of reducing the maximum takeoff gross weight from greater than 75,000 pounds to 75,000 pounds or less.

(b) *Limit of validity.* Each person identified in paragraph (c) of this section must comply with the following requirements:

(1) Establish a limit of validity of the engineering data that supports the structural maintenance program (hereafter referred to as LOV) that corresponds to the period of time, stated as a number of total accumulated flight cycles or flight hours or both, during which it is demonstrated that widespread fatigue damage will not occur in the airplane. This demonstration must include an evaluation of airplane structural configurations and be supported by test evidence and analysis at a minimum and, if available, service experience, or service experience and teardown inspection results, of high-time airplanes of similar structural design, accounting for differences in operating conditions and procedures. The airplane structural configurations to be evaluated include—

(i) All model variations and derivatives approved under the type certificate; and

(ii) All structural modifications to and replacements for the airplane structural configurations specified in paragraph (b)(1)(i) of this section, mandated by airworthiness directives as of January 14, 2011.

(2) If the LOV depends on performance of maintenance actions for which service information has not been mandated by airworthiness directive as of January 14, 2011, submit the following to the FAA Oversight Office:

(i) For those maintenance actions for which service information has been issued as of the applicable compliance date specified in paragraph (c) of this section, a list identifying each of those actions.

(ii) For those maintenance actions for which service information has not been issued as of the applicable compliance date specified in paragraph (c) of this section, a list identifying each of those actions and a binding schedule for providing in a timely manner the necessary service information for those actions. Once the FAA Oversight Office approves this schedule, each person identified in paragraph (c) of this section must comply with that schedule.

(3) Unless previously accomplished, establish an Airworthiness Limitations section (ALS) for each airplane structural configuration evaluated under paragraph (b)(1) of this section.

(4) Incorporate the applicable LOV established under paragraph (b)(1) of this section into the ALS for each airplane structural configuration evaluated under paragraph (b)(1) and submit it to the FAA Oversight Office for approval.

(c) *Persons who must comply and compliance dates.* The following persons must comply with the requirements of paragraph (b) of this section by the specified date.

(1) Holders of type certificates (TC) of airplane models identified in Table 1 of this section: No later than the applicable date identified in Table 1 of this section.

(2) Applicants for TCs, if the date of application was before January 14, 2011: No later than the latest of the following dates:

(i) January 14, 2016;

(ii) The date the certificate is issued; or

(iii) The date specified in the plan approved under § 25.571(b) for completion of the full-scale fatigue testing and demonstrating that widespread fatigue damage will not occur in the airplane structure.

(3) Applicants for amendments to TCs, with the exception of amendments to TCs specified in paragraphs (c)(6) or (c)(7) of this section, if the original TC was issued before January 14, 2011: No later than the latest of the following dates:

(i) January 14, 2016;

(ii) The date the amended certificate is issued; or

(iii) The date specified in the plan approved under § 25.571(b) for completion of the full-scale fatigue testing and demonstrating that widespread fatigue damage will not occur in the airplane structure.

(4) Applicants for amendments to TCs, with the exception of amendments to TCs specified in paragraphs (c)(6) or (c)(7) of this section, if the application for the original TC was made before January 14, 2011 but the TC was not issued before January 14, 2011: No later than the latest of the following dates:

(i) January 14, 2016;

(ii) The date the amended certificate is issued; or

(iii) The date specified in the plan approved under § 25.571(b) for completion of the full-scale fatigue testing and demonstrating that widespread fatigue damage will not occur in the airplane structure.

(5) Holders of either supplemental type certificates (STCs) or amendments to TCs that increase maximum takeoff gross weights from 75,000 pounds or less to greater than 75,000 pounds: No later than July 14, 2012.

(6) Applicants for either STCs or amendments to TCs that increase maximum takeoff gross weights from 75,000 pounds or less to greater than 75,000 pounds: No later than the latest of the following dates:

(i) July 14, 2012;

(ii) The date the certificate is issued; or

(iii) The date specified in the plan approved under § 25.571(b) for completion of the full-scale fatigue testing and demonstrating that widespread fatigue damage will not occur in the airplane structure.

(7) Applicants for either STCs or amendments to TCs that decrease maximum takeoff gross weights from greater than 75,000 pounds to 75,000 pounds or less, if the date of application was after January 14, 2011: No later than the latest of the following dates:

(i) July 14, 2012;

(ii) The date the certificate is issued; or

(iii) The date specified in the plan approved under § 25.571(b) for completion of the full-scale fatigue testing and demonstrating that widespread fatigue damage will not occur in the airplane structure.

(d) *Compliance plan.* Each person identified in paragraph (e) of this section must submit a compliance plan consisting of the following:

(1) A proposed project schedule, identifying all major milestones, for meeting the compliance dates specified in paragraph (c) of this section.

(2) A proposed means of compliance with paragraphs (b)(1) through (b)(4) of this section.

(3) A proposal for submitting a draft of all compliance items required by paragraph (b) of this section for review by the FAA Oversight Office not less than 60 days before the compliance date specified in paragraph (c) of this section, as applicable.

(4) A proposal for how the LOV will be distributed.

(e) *Compliance dates for compliance plans.* The following persons must submit the compliance plan described in paragraph (d) of this section to the FAA Oversight Office by the specified date.

(1) Holders of type certificates: No later than April 14, 2011.

(2) Applicants for TCs and amendments to TCs, with the exception of amendments to TCs specified in paragraphs (e)(4), (e)(5), or (e)(6) of this section, if the date of application was before January 14, 2011 but the TC or TC amendment was not issued before January 14, 2011: No later than April 14, 2011.

(3) Holders of either supplemental type certificates or amendments to TCs that increase maximum takeoff gross weights from 75,000 pounds or less to greater than 75,000 pounds: No later than April 14, 2011.

(4) Applicants for either STCs or amendments to TCs that increase maximum takeoff gross weights from 75,000 pounds or less to greater than 75,000 pounds, if the date of application was before January 14, 2011: No later than April 14, 2011.

(5) Applicants for either STCs or amendments to TCs that increase maximum takeoff gross weights from 75,000 pounds or less to greater than 75,000 pounds, if the date of application is on or after January 14, 2011: Within 90 days after the date of application.

(6) Applicants for either STCs or amendments to TCs that decrease maximum takeoff gross weights from greater than 75,000 pounds to 75,000 pounds or less, if the date of application is on or after January 14, 2011: Within 90 days after the date of application.

(f) *Compliance plan implementation.* Each affected person must implement the compliance plan as approved in compliance with paragraph (d) of this section.

(g) *Exceptions.* This section does not apply to the following airplane models:

(1) Bombardier BD–700.

(2) Bombardier CL–44.

(3) Gulfstream GV.

(4) Gulfstream GV–SP.

(5) British Aerospace, Aircraft Group, and Societe Nationale Industrielle Aerospatiale Concorde Type 1.

(6) British Aerospace (Commercial Aircraft) Ltd., Armstrong Whitworth Argosy A.W. 650 Series 101.

(7) British Aerospace Airbus, Ltd., BAC 1–11.

(8) BAE Systems (Operations) Ltd., BAe 146.

(9) BAE Systems (Operations) Ltd., Avro 146.

(10) Lockheed 300–50A01 (USAF C141A).

(11) Boeing 707.

(12) Boeing 720.

(13) deHavilland D.H. 106 Comet 4C.

(14) Ilyushin Aviation IL–96T.

(15) Bristol Aircraft Britannia 305.

(16) Avions Marcel Dassault-Breguet Aviation Mercure 100C.

(17) Airbus Caravelle.

(18) D & R Nevada, LLC, Convair Model 22.

(19) D & R Nevada, LLC, Convair Model 23M.

TABLE 1—COMPLIANCE DATES FOR AFFECTED AIRPLANES

Airplane model (all existing [1] models)	Compliance date—(months after January 14, 2011)
Airbus:	
A300 Series, A310 Series, A300–600 Series	18
A318 Series	48
A319 Series	48
A320 Series	48
A321 Series	48
A330–200, –200 Freighter, –300 Series	48
A340–200, –300, –500, –600 Series	48
A380–800 Series	60
Boeing:	
717	48
727 (all series)	18
737 (Classics): 737–100, –200, –200C, –300, –400, –500	18
737 (NG): 737–600, –700, –700C, –800, –900, –900ER	48
747 (Classics): 747–100, –100B, –100B SUD, –200B, -200C, –200F, –300, 747SP, 747SR	18
747–400: 747–400, –400D, –400F	48
757	48
767	48
777–200, –300	48
777–200LR, 777–300ER, 777F	60
Bombardier:	
CL–600: 2D15 (Regional Jet Series 705), 2D24 (Regional Jet Series 900)	60
Embraer:	
ERJ 170	60
ERJ 190	60
Fokker:	
F.28 Mark 0070, Mark 0100	18
Lockheed:	
L–1011	18
188	18
382 (all series)	18
McDonnell Douglas:	
DC–8, –8F	18
DC–9	18
MD–80 (DC–9–81, –82, –83, –87, MD–88)	18
MD–90	48
DC–10	18
MD–10	48
MD–11, –11F	48
All Other Airplane Models Listed on a Type Certificate as of January 14, 2011	60

[1] Type certificated as of January 14, 2011.

§ 26.23 Extended limit of validity.

(a) *Applicability.* Any person may apply to extend a limit of validity of the engineering data that supports the structural maintenance program (hereafter referred to as LOV) approved under § 25.571 of this subchapter, § 26.21, or this section. Extending an LOV is a major design change. The applicant must comply with the relevant provisions of subparts D or E of part 21 of this subchapter and paragraph (b) of this section.

(b) *Extended limit of validity.* Each person applying for an extended LOV must comply with the following requirements:

(1) Establish an extended LOV that corresponds to the period of time, stated as a number of total accumulated flight cycles or flight hours or both, during which it is demonstrated that widespread fatigue damage will not occur in the airplane. This demonstration must include an evaluation of airplane structural configurations and be supported by test evidence and analysis at a minimum and, if available, service experience, or service experience and teardown inspection results, of high-time airplanes of similar structural design, accounting for differences in operating conditions and procedures. The airplane structural configurations to be evaluated include—

(i) All model variations and derivatives approved under the type certificate for which approval for an extension is sought; and

(ii) All structural modifications to and replacements for the airplane structural configurations specified in paragraph (b)(1)(i) of this section, mandated by airworthiness directive, up to the date of approval of the extended LOV.

(2) Establish a revision or supplement, as applicable, to the Airworthiness Limitations section (ALS) of the Instructions for Continued Airworthiness required by § 25.1529 of this subchapter, and submit it to the FAA Oversight Office for approval. The revised ALS or supplement to the ALS must include the applicable extended LOV established under paragraph (b)(1) of this section.

(3) Develop the maintenance actions determined by the WFD evaluation performed in paragraph (b)(1) of this section to be necessary to preclude WFD from occurring before the airplane reaches the proposed extended LOV. These maintenance actions must be documented as airworthiness limitation items in the ALS and submitted to the FAA Oversight Office for approval.

PART 121—OPERATING REQUIREMENTS: DOMESTIC, FLAG, AND SUPPLEMENTAL OPERATIONS

■ 7. The authority citation for part 121 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 40119, 41706, 44101, 44701–44702, 44705, 44709–44711, 44713, 44716–44717, 44722, 44901, 44903–44904, 44912, 45101–45105, 46105, 46301.

■ 8. Add new § 121.1115 to read as follows:

§ 121.1115 Limit of validity.

(a) *Applicability.* This section applies to certificate holders operating any transport category, turbine-powered airplane with a maximum takeoff gross weight greater than 75,000 pounds and a type certificate issued after January 1, 1958, regardless of whether the maximum takeoff gross weight is a result of an original type certificate or a later design change. This section also applies to certificate holders operating any transport category, turbine-powered airplane with a type certificate issued after January 1, 1958, regardless of the maximum takeoff gross weight, for which a limit of validity of the engineering data that supports the structural maintenance program (hereafter referred to as LOV) is required in accordance with § 25.571 or § 26.21 of this chapter after January 14, 2011.

(b) *Limit of validity.* No certificate holder may operate an airplane identified in paragraph (a) of this section after the applicable date identified in Table 1 of this section unless an Airworthiness Limitations section approved under Appendix H to part 25 or § 26.21 of this chapter is incorporated into its maintenance program. The ALS must—

(1) Include an LOV approved under § 25.571 or § 26.21 of this chapter, as applicable, except as provided in paragraph (f) of this section; and

(2) Be clearly distinguishable within its maintenance program.

(c) *Operation of airplanes excluded from § 26.21.* No certificate holder may operate an airplane identified in § 26.21(g) of this chapter after July 14, 2013, unless an Airworthiness Limitations section approved under Appendix H to part 25 or § 26.21 of this chapter is incorporated into its maintenance program. The ALS must—

(1) Include an LOV approved under § 25.571 or § 26.21 of this chapter, as applicable, except as provided in paragraph (f) of this section; and

(2) Be clearly distinguishable within its maintenance program.

(d) *Extended limit of validity.* No certificate holder may operate an airplane beyond the LOV, or extended LOV, specified in paragraph (b)(1), (c), (d), or (f) of this section, as applicable, unless the following conditions are met:

(1) An ALS must be incorporated into its maintenance program that—

(i) Includes an extended LOV and any widespread fatigue damage airworthiness limitation items approved under § 26.23 of this chapter; and

(ii) Is approved under § 26.23 of this chapter.

(2) The extended LOV and the airworthiness limitation items pertaining to widespread fatigue damage must be clearly distinguishable within its maintenance program.

(e) *Principal Maintenance Inspector approval.* Certificate holders must submit the maintenance program revisions required by paragraphs (b), (c), and (d) of this section to the Principal Maintenance Inspector for review and approval.

(f) *Exception.* For any airplane for which an LOV has not been approved as of the applicable compliance date specified in paragraph (c) or Table 1 of this section, instead of including an approved LOV in the ALS, an operator must include the applicable default LOV specified in Table 1 or Table 2 of this section, as applicable, in the ALS.

TABLE 1—AIRPLANES SUBJECT TO § 26.21

Airplane model	Compliance date—months after January 14, 2011	Default LOV [flight cycles (FC) or flight hours (FH)]
Airbus—Existing[1] Models Only:		
A300 B2–1A, B2–1C, B2K–3C, B2–203	30	48,000 FC
A300 B4–2C, B4–103	30	40,000 FC
A300 B4–203	30	34,00 FC
A300–600 Series	30	30,000 FC/67,500 FH
A310–200 Series	30	40,000 FC/60,000 FH
A310–300 Series	30	35,000 FC/60,000 FH
A318 Series	60	48,000 FC/60,000 FH
A319 Series	60	48,000 FC/60,000 FH
A320–100 Series	60	48,000 FC/48,000 FH
A320–200 Series	60	48,000 FC/60,000 FH
A321 Series	60	48,000 FC/60,000 FH
A330–200, –300 Series (except WV050 family) (non enhanced)	60	40,000 FC/60,000 FH
A330–200, –300 Series WV050 family (enhanced)	60	33,000 FC/100,000 FH
A330–200 Freighter Series	60	*See* NOTE.
A340–200, –300 Series (except WV 027 and WV050 family) (non enhanced)	60	20,000 FC/80,000 FH
A340–200, –300 Series WV 027 (non enhanced)	60	30,000 FC/60,000 FH
A340–300 Series WV050 family (enhanced)	60	20,000 FC/100,000 FH
A340–500, –600 Series	60	16,600 FC/100,000 FH
A380–800 Series	72	*See* NOTE.
Boeing—Existing[1] Models Only:		
717	60	60,000 FC/60,000 FH
727 (all series)	30	60,000 FC
737 (Classics): 737–100, –200, –200C, –300, –400, –500	30	75,000 FC
737 (NG): 737–600, –700, –700C, –800, –900, –900ER	60	75,000 FC
747 (Classics): 747–100, –100B, –100B SUD, –200B, –200C, –200F, –300, 747SP, 747SR.	30	20,000 FC
747–400: 747–400, –400D, –400F	60	20,000 FC
757	60	50,000 FC
767	60	50,000 FC
777–200, –300	60	40,000 FC

TABLE 1—AIRPLANES SUBJECT TO § 26.21—Continued

Airplane model	Compliance date—months after January 14, 2011	Default LOV [flight cycles (FC) or flight hours (FH)]
777–200LR, 777–300ER	72	40,000 FC
777F	72	11,000 FC
Bombardier—Existing[1] Models Only:		
CL–600: 2D15 (Regional Jet Series 705), 2D24 (Regional Jet Series 900)	72	60,000 FC
Embraer—Existing[1] Models Only:		
ERJ 170	72	*See* NOTE.
ERJ 190	72	*See* NOTE.
Fokker—Existing[1] Models Only:		
F.28 Mark 0070, Mark 0100	30	90,000 FC
Lockheed—Existing[1] Models Only:		
L–1011	30	36,000 FC
188	30	26,600 FC
382 (all series)	30	20,000 FC/50,000 FH
McDonnell Douglas—Existing[1] Models Only:		
DC–8, –8F	30	50,000 FC/50,000 FH
DC–9 (except for MD–80 models)	30	100,000 FC/100,000 FH
MD–80 (DC–9–81, –82, –83, –87, MD–88)	30	50,000 FC/50,000 FH
MD–90	60	60,000 FC/90,000 FH
DC–10–10, –15	30	42,000 FC/60,000 FH
DC–10–30, –40, –10F, –30F, –40F	30	30,000 FC/60,000 FH
MD–10–10F	60	42,000 FC/60,000 FH
MD–10–30F	60	30,000 FC/60,000 FH
MD–11, MD–11F	60	20,000 FC/60,000 FH
Maximum Takeoff Gross Weight Changes:		
All airplanes whose maximum takeoff gross weight has been decreased to 75,000 pounds or below after January 14, 2011 or increased to greater than 75,000 pounds at any time by an amended type certificate or supplemental type certificate.	30, or within 12 months after the LOV is approved, or before operating the airplane, whichever occurs latest.	Not applicable.
All Other Airplane Models (TCs and amended TCs) not Listed in Table 2	72, or within 12 months after the LOV is approved, or before operating the airplane, whichever occurs latest.	Not applicable.

[1] Type certificated as of January 14, 2011.

Note: Airplane operation limitation is stated in the Airworthiness Limitation section.

TABLE 2—AIRPLANES EXCLUDED FROM § 26.21

Airplane model	Default LOV [flight cycles (FC) or flight hours (FH)]
Airbus:	
Caravelle	15,000 FC/24,000 FH
Avions Marcel Dassault:	
Breguet Aviation Mercure 100C	20,000 FC/16,000 FH
Boeing:	
Boeing 707 (-100 Series and -200 Series)	20,000 FC
Boeing 707 (-300 Series and -400 Series)	20,000 FC
Boeing 720	30,000 FC
Bombardier:	
CL–44D4 and CL–44J	20,000 FC
BD–700	15,000 FH
Bristol Aeroplane Company:	
Britannia 305	10,000 FC
British Aerospace Airbus, Ltd.:	
BAC 1–11 (all models)	85,000 FC
British Aerospace (Commercial Aircraft) Ltd.:	
Armstrong Whitworth Argosy A.W. 650 Series 101	20,000 FC
BAE Systems (Operations) Ltd.:	
BAe 146–100A (all models)	50,000 FC
BAe 146–200–07	50,000 FC
BAe 146–200–07 Dev	50,000 FC
BAe 146–200–11	50,000 FC
BAe 146–200–07A	47,000 FC
BAe 146–200–11 Dev	43,000 FC

TABLE 2—AIRPLANES EXCLUDED FROM § 26.21—Continued

Airplane model	Default LOV [flight cycles (FC) or flight hours (FH)]
BAe 146–300 (all models)	40,000 FC
Avro 146–RJ70A (all models)	40,000 FC
Avro 146–RJ85A and 146–RJ100A (all models)	50,000 FC
D & R Nevada, LLC:	
Convair Model 22	1,000 FC/1,000 FH
Convair Model 23M	1,000 FC/1,000 FH
deHavilland Aircraft Company, Ltd.:	
D.H. 106 Comet 4C	8,000 FH
Gulfstream:	
GV	40,000 FH
GV–SP	40,000 FH
Ilyushin Aviation Complex:	
IL–96T	10,000 FC/30,000 FH
Lockheed:	
300–50A01 (USAF C 141A)	20,000 FC

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

■ 9. The authority citation for part 129 continues to read:

Authority: 49 U.S.C. 1372, 40113, 40119, 44101, 44701–44702, 44705, 44709–44711, 44713, 44716–44717, 44722, 44901–44904, 44906, 44912, 46105, Pub. L. 107–71 sec. 104.

■ 10. Add new § 129.115 to read as follows:

§ 129.115 Limit of validity.

(a) *Applicability.* This section applies to foreign air carriers or foreign persons operating any U.S.-registered transport category, turbine-powered airplane with a maximum takeoff gross weight greater than 75,000 pounds and a type certificate issued after January 1, 1958, regardless of whether the maximum takeoff gross weight is a result of an original type certificate or a later design change. This section also applies to foreign air carriers or foreign persons operating any other U.S.-registered transport category, turbine-powered airplane with a type certificate issued after January 1, 1958, regardless of the maximum takeoff gross weight, for which a limit of validity of the engineering data that supports the structural maintenance program (hereafter referred to as LOV) is required in accordance with § 25.571 or § 26.21 of this chapter after January 14, 2011.

(b) *Limit of validity.* No foreign air carrier or foreign person may operate a U.S.-registered airplane identified in paragraph (a) of this section after the applicable date identified in Table 1 of this section, unless an Airworthiness Limitations section (ALS) approved under Appendix H to part 25 or § 26.21 of this chapter is incorporated into its maintenance program. The ALS must—

(1) Include an LOV approved under § 25.571 or § 26.21 of this chapter, as applicable, except as provided in paragraph (f) of this section; and

(2) Be clearly distinguishable within its maintenance program.

(c) *Operation of airplanes excluded from § 26.21.* No certificate holder may operate an airplane identified in § 26.21(g) of this chapter after July 14, 2013, unless an ALS approved under Appendix H to part 25 or § 26.21 of this chapter is incorporated into its maintenance program. The ALS must—

(1) Include an LOV approved under § 25.571 or § 26.21 of this chapter, as applicable, except as provided in paragraph (f) of this section; and

(2) Be clearly distinguishable within its maintenance program

(d) *Extended limit of validity.* No foreign air carrier or foreign person may operate an airplane beyond the LOV or extended LOV specified in paragraph (b)(1), (c), (d), or (f) of this section, as applicable, unless the following conditions are met:

(1) An ALS must be incorporated into its maintenance program that—

(i) Includes an extended LOV and any widespread fatigue damage airworthiness limitation items (ALIs) approved under § 26.23 of this chapter; and

(ii) Is approved under § 26.23 of this chapter;

(2) The extended LOV and the airworthiness limitation items pertaining to widespread fatigue damage must be clearly distinguishable within its maintenance program.

(e) *Principal Maintenance Inspector approval.* Foreign air carriers or foreign persons must submit the maintenance program revisions required by paragraphs (b), (c), and (d) of this section to the Principal Maintenance Inspector or Flight Standards International Field Office for review and approval.

(f) *Exception.* For any airplane for which an LOV has not been approved as of the applicable compliance date specified in paragraph (c) or Table 1 of this section, instead of including an approved LOV in the ALS, an operator must include the applicable default LOV specified in Table 1 or Table 2 of this section, as applicable, in the ALS.

TABLE 1—AIRPLANES SUBJECT TO § 26.21

Airplane model	Compliance date—months after January 14, 2011	Default LOV [flight cycles (FC) or flight hours (FH)]
Airbus—Existing [1] Models Only:		
A300 B2–1A, B2–1C, B2K–3C, B2–203	30	48,000 FC
A300 B4–2C, B4–103	30	40,000 FC
A300 B4–203	30	34,000 FC
A300–600 Series	30	30,000 FC/67,500 FH

TABLE 1—AIRPLANES SUBJECT TO § 26.21—Continued

Airplane model	Compliance date—months after January 14, 2011	Default LOV [flight cycles (FC) or flight hours (FH)]
A310–200 Series	30	40,000 FC/60,000 FH
A310–300 Series	30	35,000 FC/60,000 FH
A318 Series	60	48,000 FC/60,000 FH
A319 Series	60	48,000 FC/60,000 FH
A320–100 Series	60	48,000 FC/48,000 FH
A320–200 Series	60	48,000 FC/60,000 FH
A321 Series	60	48,000 FC/60,000 FH
A330–200, –300 Series (except WV050 family) (non enhanced)	60	40,000 FC/60,000 FH
A330–200, –300 Series WV050 family (enhanced)	60	33,000 FC/100,000 FH
A330–200 Freighter Series	60	*See* NOTE.
A340–200, –300 Series (except WV 027 and WV050 family) (non enhanced)	60	20,000 FC/80,000 FH
A340–200, –300 Series WV 027 (non enhanced)	60	30,000 FC/60,000 FH
A340–300 Series WV050 family (enhanced)	60	20,000 FC/100,000 FH
A340–500, –600 Series	60	16,600 FC/100,000 FH
A380–800 Series	72	*See* NOTE.
Boeing—Existing [1] Models Only:		
717	60	60,000 FC/60,000 FH
727 (all series)	30	60,000 FC
737 (Classics): 737–100, –200, –200C, –300, –400, –500	30	75,000 FC
737 (NG): 737–600, –700, –700C, –800, –900, –900ER	60	75,000 FC
747 (Classics): 747–100, –100B, –100B SUD, –200B, –200C, –200F, –300, 747SP, 747SR.	30	20,000 FC
747–400: 747–400, –400D, –400F	60	20,000 FC
757	60	50,000 FC
767	60	50,000 FC
777–200, –300	60	40,000 FC
777–200LR, 777–300ER	72	40,000 FC
777F	72	11,000 FC
Bombardier—Existing [1] Models Only:		
CL–600: 2D15 (Regional Jet Series 705), 2D24 (Regional Jet Series 900)	72	60,000 FC
Embraer—Existing [1] Models Only:		
ERJ 170	72	*See* NOTE.
ERJ 190	72	*See* NOTE.
Fokker—Existing [1] Models Only:		
F.28 Mark 0070, Mark 0100	30	90,000 FC
Lockheed—Existing [1] Models Only:		
L–1011	30	36,000 FC
188	30	26,600 FC
382 (all series)	30	20,000 FC/50,000 FH
McDonnell Douglas—Existing [1] Models Only:		
DC–8, –8F	30	50,000 FC/50,000 FH
DC–9 (except for MD–80 series)	30	100,000 FC/100,000 FH
MD–80 (DC–9–81, –82, –83, –87, MD–88)	30	50,000 FC/50,000 FH
MD–90	60	60,000 FC/90,000 FH
DC–10–10, –15	30	42,000 FC/60,000 FH
DC–10–30, –40, –10F, –30F, –40F	30	30,000 FC/60,000 FH
MD–10–10F	60	42,000 FC/60,000 FH
MD–10–30F	60	30,000 FC/60,000 FH
MD–11, MD–11F	60	20,000 FC/60,000 FH
Maximum Takeoff Gross Weight Changes	30, or within 12 months after the LOV is approved, or before operating the airplane, whichever occurs latest.	Not applicable.
All airplanes whose maximum takeoff gross weight has been decreased to 75,000 pounds or below after January 14, 2011 or increased to greater than 75,000 pounds at any time by an amended type certificate or supplemental type certificate.		
All Other Airplane Models (TCs and amended TCs) not Listed in Table 2	72, or within 12 months after the LOV is approved, or before operating the airplane, whichever occurs latest.	Not applicable.

[1] Type certificated as of January 14, 2011.

Note: Airplane operation limitation is stated in the Airworthiness Limitation section.

TABLE 2—AIRPLANES EXCLUDED FROM § 26.21

Airplane model	Default LOV [flight cycles (FC) or flight hours (FH)]
Airbus:	
Caravelle	15,000 FC/24,000 FH
Avions Marcel Dassault:	
Breguet Aviation Mercure 100C	20,000 FC/16,000 FH
Boeing:	
Boeing 707 (–100 Series and –200 Series)	20,000 FC
Boeing 707 (–300 Series and –400 Series)	20,000 FC
Boeing 720	30,000 FC
Bombardier:	
CL–44D4 and CL–44J	20,000 FC
BD–700	15,000 FH
Bristol Aeroplane Company:	
Britannia 305	10,000 FC
British Aerospace Airbus, Ltd.:	
BAC 1–11 (all models)	85,000 FC
British Aerospace (Commercial Aircraft) Ltd.:	
Armstrong Whitworth Argosy A.W. 650 Series 101	20,000 FC
BAE Systems (Operations) Ltd.:	
BAe 146–100A (all models)	50,000 FC
BAe 146–200–07	50,000 FC
BAe 146–200–07 Dev	50,000 FC
BAe 146–200–11	50,000 FC
BAe 146–200–07A	47,000 FC
BAe 146–200–11 Dev	43,000 FC
BAe 146–300 (all models)	40,000 FC
Avro 146–RJ70A (all models)	40,000 FC
Avro 146–RJ85A and 146–RJ100A (all models)	50,000 FC
D & R Nevada, LLC:	
Convair Model 22	1,000 FC/1,000 FH
Convair Model 23M	1,000 FC/1,000 FH
deHavilland Aircraft Company, Ltd.:	
D.H. 106 Comet 4C	8,000 FH
Gulfstream:	
GV	40,000 FH
GV–SP	40,000 FH
Ilyushin Aviation Complex:	
IL–96T	10,000 FC/30,000 FH
Lockheed:	
300–50A01 (USAF C 141A)	20,000 FC

Issued in Washington, DC, on October 28, 2010.

J. Randolph Babbitt,

Administrator.

[FR Doc. 2010–28363 Filed 11–12–10; 8:45 am]

BILLING CODE 4910–13–P