**[4910-13]**

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Parts 1, 21, 25, 26, 91, 121, 125, and 129.**

**Docket No.: FAA-2004-18379; Amendment Nos. 1-60, 21-90, 25-123, 26-0, 91-297, 121-336, 125-53, 129-43**

**RIN 2120–AI31**

Enhanced Airworthiness Program for Airplane Systems/Fuel Tank Safety (EAPAS/FTS)

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

**ACTION:** Final rule.

**SUMMARY:** This final rule amends FAA regulations for certification and operations of transport category airplanes. These changes are necessary to help ensure continued safety of commercial airplanes. They improve the design, installation, and maintenance of airplane electrical wiring systems and align those requirements as closely as possible with the requirements for fuel tank system safety. This final rule organizes and clarifies design requirements for wire systems by moving existing regulatory references to wiring into a single section of the regulations specifically for wiring and by adding new certification rules. It requires holders of type certificates for certain transport category airplanes to conduct analyses of their airplanes and make necessary changes to existing Instructions for Continued Airworthiness (ICA) to improve maintenance procedures for wire systems. It requires operators to incorporate ICA for wiring into their maintenance or inspection programs. And finally, this final rule clarifies requirements of certain existing rules for operators to incorporate ICA for fuel tank systems into their maintenance or inspection programs.

**DATES:** These amendments become effective December 10, 2007.

**FOR FURTHER INFORMATION CONTACT**: If you have technical questions about the certification rules in this action, contact Stephen Slotte, ANM-111, Airplane & Flight Crew Interface, Federal Aviation Administration, 1601 Lind Avenue SW, Renton, WA 98057-3356; telephone (425) 227-2315; facsimile (425) 227-1320, e-mail steve.slotte@faa.gov. If you have technical questions about the operating rules, contact Fred Sobeck, AFS-308, Aircraft Maintenance Division, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591; telephone: (202) 267-7355; facsimile (202) 267-7335, e-mail frederick.sobeck@faa.gov. Direct any legal questions to 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 regarding aviation safety is found in Title 49 of the United States Code. Subtitle I, Section 106 describes the authority of the FAA Administrator. Subtitle VII, Aviation Programs, describes in more detail the scope of the agency's authority.

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

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

**CONTENTS**

**I. EXECUTIVE SUMMARY**

**II. BACKGROUND**

**A. Summary of the NPRM**

**1. The Proposed Rule**

**2. Related Activities**

**B. Differences between the NPRM and the Final Rule**

**C. Summary of Comments**

**III. DISCUSSION OF THE FINAL RULE**

**A. Overview**

**B. Design Approval Holder (DAH) Requirements (Part 26)**

**1. Requirements to Develop ICA**

**2. Changes to Location of Design Approval Holder Requirements**

**3. Interaction Between New Design Approval Holder Requirements and Part 21**

**4. Compliance Dates**

**5. The Design Approval Holder Compliance Plan**

**6. Defining the Representative Airplane**

**7. Impact on Operators**

**8. EZAPs Already Completed**

**9. Wire Inspections**

**10. Protections and Cautions**

**11. Alignment of EWIS and Fuel Tank ICA**

**12. Approval of ICA**

**13. Rule Applicability**

**14. Non-U.S. Manufacturers**

15. **General Comments about Design Approval Holder Requirements**
16. **Airplanes Excluded from Design Approval Holder and EWIS Operating Requirements**

**C. Electrical Wiring Interconnection System (EWIS) Certification Rules (Part 25 Subpart H)**

1. **New Subpart for EWIS**
2. **The Definition of EWIS (§ 25.1701)**
3. **Functions and Installation: EWIS (§ 25.1703)**
4. **Systems and Functions: EWIS (§ 25.1705)**
5. **System Separation: EWIS (§ 25.1707)**
6. **System Safety: EWIS (§ 25.1709)**
7. **Component Identification: EWIS (§ 25.1711)**
8. **Fire Protection: EWIS (§ 25.1713)**
9. **Electrical Bonding and Protection against Static Electricity: EWIS (§ 25.1715)**
10. **Accessibility Provisions: EWIS (§ 25.1719)**
11. **Protection of EWIS (§ 25.1721)**
12. **Flammable Fluid Shutoff Means: EWIS (§ 25.1727)**
13. **Powerplant and APU Fire Detection System: EWIS (§ 25.1731)**
14. **Fire Detector Systems, General: EWIS (§ 25.1733)**
15. **Engine, Nacelle, and APU Wiring**
16. **Designated Fire Zones**
17. **Goal of the New Wiring Subpart**
18. **Harmonization**

**D. Instructions for Continued Airworthiness: EWIS (§ 25.1729 and Appendix H)**

1. **Requirements for EWIS ICA**
2. **ICA as a Single Document**

3. **Standard Wiring Practices Manuals**

4. **Mandatory Replacement Times**

5. **Wire Identification Method Information**

6. **Electrical Load Data**

**E. Continued Airworthiness and Safety Improvements Subparts for Operating Rules (Parts 91, 121, 125, 129)**

1. **Establishment of New Subparts**

2. **Continued Airworthiness Subparts and Airworthiness Directives**

3. **Type and Scope of Requirements**

**F. Operating Requirements for EWIS (Parts 121 and 129)**

1. **Requirements for Maintenance and Inspection Program Revisions**

2. **ICA Developed by Design Approval Holders**

3. **Different Requirements for Existing and Future Designs**

4. **ICA for Alterations**

5. **Alaska Operations**

6. **EWIS Inspections**

7. **Non-U.S. Registered Airplanes**

8. **Taking Airplanes out of Service**

9. **Training**

10. **Reporting Requirements**

**G. Operating Requirements for Fuel Tank Systems (Parts 91, 121, 125, and 129)**

1. **Requirements for Maintenance and Inspection Program Revisions**

2. **Airplanes Excluded from Fuel Tank System Operating Requirements**

3. **Change in Operator Compliance Date for Auxiliary Fuel Tank ICA**

4. **Original Configuration and Auxiliary Fuel Tanks**

5. **Inspection and Maintenance Program Terminology**

**H. Regulatory Evaluation**

1. **Engine Costs**
2. **Wiring System Safety Analysis for Engines**
3. **Labor Rates**
4. **The Regional Airplane Fleet**
5. **Measure of Effectiveness**
6. **Operational Impacts**
7. **Training Costs**
8. **Costs for EZAP Analysis and Inspection of Engines**
9. **Engine Costs of § 25.1362**
10. **Wire Labeling Costs**
11. **Additional Certification and Operator Costs**
12. **Previous Rulemaking**
13. **Relevance to the Current Fleet**
14. **Accidents Indirectly Initiated by EWIS**

**I. Harmonization Changes to Transport Category Certification Rules (Part 25)**

1. **FAA/JAA (Joint Aviation Authority) Harmonization**
2. **Circuit Protective Devices (§ 25.1357)**
3. **Precautions against Injury (§ 25.1360)**
4. **Electrical Supplies for Emergency Conditions (§ 25.1362)**
5. **Electrical Appliances, Motors, and Transformers (§ 25.1365)**

**J. Additional Certification Rule Changes (Part 25)**

1. **Rules Changed to Accommodate Subpart H**
2. **Electrical Equipment and Installations (§ 25.1353)**

**IV. REGULATORY NOTICES AND ANALYSES**

**V. THE AMENDMENTS**

## I. EXECUTIVE SUMMARY

Safety concerns about wiring systems in airplanes were brought to the forefront of public attention by a midair explosion in 1996 involving a 747 airplane. Ignition of flammable vapors in the fuel tank was the probable cause of that fatal accident, and the most likely source was a wiring failure that allowed a spark to enter the fuel tank. All 230 people aboard the airplane were killed. Two years later, an MD-11 airplane crashed into the Atlantic Ocean, killing all 229 people aboard. Although an exact cause could not be determined, the presence of resolidified copper on a portion of a wire of the in-flight entertainment system cable indicated that wire arcing had occurred in the area where the fire most likely originated.

Investigations of those accidents and later examinations of other airplanes showed a collection of common problems. Deteriorated wiring, corrosion, improper wire installation and repairs, and contamination of wire bundles with metal shavings, dust, and fluids (which would provide fuel for fire) were common conditions in representative examples of the "aging fleet of transport airplanes."

The FAA has concluded that current maintenance practices do not adequately address wiring components, wiring inspection criteria are too general, and maintenance instructions do not describe unacceptable conditions, such as improper repairs and installations, in enough detail.

With this final rule we are introducing new maintenance, inspection, and design criteria for airplane wiring to address conditions that put transport airplanes at risk of wire failures, smoke, and fire. We are adding requirements for type certificate holders and applicants for type certificates and supplemental type certificates to analyze the zones of their airplanes for the presence of wire and for the likely accumulation of contaminant materials. This final rule also requires them to develop maintenance and inspection tasks to identify, correct, and prevent wiring conditions that introduce risk to continued safe flight. We are requiring that these tasks be included in new Instructions for Continued Airworthiness for wiring and that they be compatible with Instructions for Continued Airworthiness for fuel tank systems. The EWIS ICA

must not conflict with the ICA for fuel tanks, and must avoid duplication and redundancy. Too frequent disturbance to electrical wiring by repeated moving, pulling, and flexing of the wire bundles will induce unnecessary stress on the wiring and its components, which in turn could lead to degradation, expedited aging, and failures. Thus it is important that redundant tasks and unnecessary disturbances to the electrical wiring be minimized. We are amending Title 14 Code of Federal Regulations (CFR) parts 91, 121, 125, and 129 operating rules to require operators of transport category airplanes to incorporate maintenance and inspection tasks for wiring into their regular maintenance programs and we are clarifying existing requirements for fuel tanks.[1] We are creating a new subpart of part 25 to contain the majority of the certification requirements for airplane wiring, including new rules to improve safety in manufacture and modification. Finally, we are creating a new part 26 for design approval holder requirements relating to continued airworthiness and safety improvements and new subparts in parts 91, 121, 125, and 129 for the same types of requirements for operators.

Accompanying this final rule are guidance materials in the form of advisory circulars (AC), which present one way, but not the only way, to comply with specific parts of these regulations.

One of the ACs presents a suggested curriculum for electrical wiring interconnection system (EWIS) training. Existing § 121.375 requires that certificate holders or anyone performing maintenance have a training program. This requirement ensures that anyone determining the adequacy of maintenance work (including inspectors) is fully informed about the procedures and techniques involved and is competent to perform them. AC 120-94 provides guidance for complying with § 121.375 as it applies to EWIS maintenance and inspection. In AC 120-94 we provide a suggested training program to address the informational needs of the various people who come in contact with airplane EWIS, and we encourage operators to include

[1] We are not amending 14 CFR part 135 because presently there are only 20 airplanes with sufficient passenger or payload capacity to be affected by this rule that fly in part 135 operations. Should part 135 be amended to permit widespread usage of these larger transport category airplanes, we may extend the operating requirements of today's rule to part 135 at that time.

this training voluntarily. While the Aging Transport Systems Rulemaking Advisory Committee (ATSRAC) had recommended some form of EWIS training be required for anyone likely to come into contact with EWIS, we have determined the associated cost would be unduly burdensome. There are 11 other ACs accompanying this rule which provide guidance on different requirements contained here. A few of them have been revised for clarification. In those instances, this will be noted in section III. Otherwise, except for minor editorial changes, the guidance accompanying this rule is being published in the same form in which it was proposed and will not be discussed here.

Since the Notice of Proposed Rulemaking (NPRM), the National Transportation Safety Board (NTSB) has issued Safety Recommendations A-06-29 through -35 pertaining to fires on one particular model of regional jet. In the 6 months between October 2005 and March 2006, there were a total of 6 fires on regional jets. A seventh fire occurred prior to that 6-month period. The NTSB stated that, in addition to the danger posed by the fires, 2 of the incident airplanes temporarily lost all flight displays. The NTSB's investigation revealed that all of the fires originated from the same electrical component—an electrical contactor located in the avionics compartment beneath the floor of the captain's seat. The fires were caused by moisture-induced short circuits between the electrical terminals of the contactors. We have issued airworthiness directives (AD) to correct this unsafe condition. However, if the requirements in this final rule had been in effect, the type of failure that caused these 7 fires would not have occurred. This is because several of the new requirements directly address design issues that led to the fires. This final rule is meant to proactively address wiring conditions existing in the transport airplane fleet that we now know affect safe flight and can be detected, corrected, or prevented.

We express present value benefits and costs using a 7% discount rate. The total estimated benefits of this final rule, $801 million ($388 present value) over a 25-year period, are comprised of operational benefits and safety benefits. The operational benefits are estimated at $506.3 million ($237.5 million present value). The safety benefits are estimated at $294.6

million ($150.6 million present value). This final rule will prevent a portion of fatal and non-fatal incidents and accidents while decreasing the impact that EWIS discrepancies have on airline operations.

The estimated total cost of this final rule is $416 million ($233 million present value) over 25 years. The majority of these costs ($292.2 million, or $147.6 million present value) will be borne by operators. The remainder of the projected costs will be borne by aircraft and engine manufacturers, and, to a much lesser extent, the FAA Oversight Offices.

## II. BACKGROUND

### A. Summary of the NPRM

#### 1. The Proposed Rule

On October 6, 2005, (70 FR 58508) the FAA published in the Federal Register the Notice of Proposed Rulemaking (NPRM) entitled Enhanced Airworthiness Program for Airplane Systems/Fuel Tank Safety (EAPAS/FTS), which is the basis of this final rule.

In that NPRM, we proposed development of Instructions for Continued Airworthiness (ICA) for wiring systems and subsequent incorporation of those ICA into operators' maintenance programs. We also proposed alignment of the compliance times for operators to incorporate wire and fuel tank system ICA into their maintenance programs.

We proposed changes in the certification rules to require more attention during the design and installation of airplane systems to conditions that could compromise wire safety and accessibility. And we proposed a new part 25 subpart that would be dedicated to current and new regulations about airplane wiring systems.

If you would like more details about the proposal, you can get a copy by following the instructions under the Availability of Rulemaking Documents heading at the end of this preamble.

#### 2. Related Activities

On July 12, 2005, the FAA published in the Federal Register a statement of policy for future management of the shared responsibility between design approval holders (DAH) and

operators in achieving certain types of safety objectives. That stated policy is reflected in the requirements of this final rule for DAHs to develop ICA for airplane wiring systems.

Also published in the July 12, 2005 Federal Register was a disposition of comments on a previous notice to extend the date for operators to comply with special maintenance requirements for fuel tank systems. That date was extended from December 6, 2004 to December 16, 2008.

On July 7, 2006, we published notice in the Federal Register stating that, although we had originally proposed to align compliance times for operator incorporation of ICA for wiring and for fuel tanks, we later found it impractical to do so. This notice notified operators that their compliance date for incorporation of fuel tank ICA is still December 16, 2008.

Twelve draft ACs on different aspects of the rule accompanied the NPRM and were made available for public comment at the same time. On November 8, 2005, the comment period for the ACs was extended to February 3, 2006, so that it would align with the comment period for the NPRM.

**B. Differences between the NPRM and the Final Rule**

We have revised the numbering for 14 CFR part 25 subpart H Electrical Wiring Interconnection Systems (EWIS). We did this to harmonize as much as possible with the planned European Aviation Safety Agency (EASA) version of these rules. As discussed later, the design approval holder requirements proposed in the NPRM as subpart I are now contained in new part 26, again to harmonize more easily with the regulatory structure of other national airworthiness authorities. We also have made some changes to the compliance planning sections of those rules. In response to comments, we have increased the compliance time for the design approval holder requirements to 24 months from the effective date of this rule. We have increased the time for operator compliance with the EWIS requirements to 39 months from the effective date of this rule. Because our regulatory process exceeded the time we had originally planned for issuance of this rule, it is no longer practical to align the operator compliance dates for the EWIS ICA with those for fuel tanks. Coordination of the timing of the maintenance tasks within those ICA is still desirable and possible, so that aspect of our proposal remains unchanged

in the final rule. We have, however, extended the date for operators to submit ICA for auxiliary fuel tanks to the FAA Oversight Office.

We have removed some airplanes from the exclusion lists of the DAH requirements and the operating rules. This was either because they were already excluded as a result of the definition of the affected airplanes or because we have reconsidered the rationale for certain exclusions. We have also made other, minor, changes in wording to the proposed rules for the purposes of clarification or harmonization. We discuss all of the changes in section III of this preamble.

### C. Summary of Comments

The FAA received 39 comment letters about the proposed rule and guidance material. The comments covered a wide spectrum of topics and a range of responses, which we discuss more fully below. There was much support for the general intent of the rule and the guidance material. There were also requests for changes and for clarification.

## III. DISCUSSION OF THE FINAL RULE

### A. Overview

This rule is a result of years of study, data gathering, and collaboration with industry. It has been developed as a solution to the problem of wire contamination and wire damage on airplanes, which can result in system failures, smoke, and fire, and can threaten continued safe flight.

Examinations by the Aging Systems Task Force of representative airplanes from the fleet of aging transports revealed wiring that was deteriorated, corroded, improperly installed and repaired, and contaminated with materials such as metal shavings, dust, and fluids[2]. The NTSB, as well as working groups of the FAA, industry, and other Civil Aviation Authorities, found these conditions to be common across the fleet, not just isolated instances of poor maintenance. While systems have always been subject to careful scrutiny of their safety and reliability during

[2] Transport Aircraft Intrusive Inspection Project final report dated December 29, 2000.

the certification process, the wires that connect those systems had been considered appropriately cared for when fitted and maintained according to standard industry practices.

Now we know that airplane wiring needs more attention. It needs to be considered as a discreet system, and given the same careful scrutiny as other systems. The design of wiring systems is important for creating safe separation from other wires and systems and protecting it from damage. Inspection and maintenance is important in uncovering and repairing wire damage and preventing buildup of contaminants that can cause damage and that also provide fuel for fire. Wire must be inspected regularly and contaminant buildup must be prevented.

In considering the problems found on transport category airplanes, we explored various alternatives. One alternative was to do nothing. But the result of that approach would be a continuation of incidents and accidents caused by deteriorated wiring systems. Once we knew there was a problem affecting safe flight, doing nothing was not really an option. We could have asked for voluntary support. But voluntary programs in the past have not always resulted in complete participation, and a voluntary program could not guarantee the level of safety we want to ensure. Accordingly, we decided to develop a rule to correct potential safety problems with airplane wiring, and to require compliance of all those whose participation is necessary to achieve that goal.

This rule enlists the aid of design approval holders in assessing the wiring on their airplanes and in developing inspection and maintenance tasks that operators can use to maintain wire safety. It requires operators to incorporate into their inspection and maintenance programs tasks for maintaining wire safety that are based on those developed in accordance with requirements. It introduces new certification rules for wire separation, identification, system safety, protection from damage, access, and other aspects of wire safety. It creates a new subpart in the certification rules for wire certification so that the many existing requirements are more easily found. It also requires that design approval holders align inspection and maintenance tasks for wiring with those for fuel tank systems, to avoid duplication and to ensure that the most rigorous task is accomplished. As an example, if the EWIS ICA calls for a general visual

inspection of a certain wire and the fuel tank ICA calls for a detailed inspection of the same wire, the general visual inspection task would be removed from the EWIS ICA and the detailed inspection would be retained in the fuel tank ICA, identified as both a fuel tank task and an EWIS task.

**B. Design Approval Holder (DAH) Requirements (Part 26)**

For design approval holders this final rule differs from the proposal in the following four ways.

- The physical location of the rule has changed, from the proposed location in part 25, subpart I, to a new part 26.[3]
- The compliance date has been changed from December 16, 2007, to 24 months after the effective date of the rule.
- Two changes were made to the compliance plan requirement.
- The definition of the "representative airplane" has been clarified.

We have also made minor wording revisions to section 26.11 for clarification. They do not change the requirements.

**1. Requirements to Develop ICA**

As discussed above, this rule introduces requirements for design approval holders (DAH) to assess their airplanes in relation to wiring. The assessment must be performed with an enhanced zonal analysis procedure (EZAP), which is outlined in a part-25-series advisory circular accompanying this rule entitled AC 25-27 "Development of Transport Category Airplane Electrical Wiring Interconnection Systems Instructions for Continued Airworthiness Using an Enhanced Zonal Analysis Procedure." This AC was originally titled AC 120-XX "Program to Enhance Aircraft Electrical Wiring Interconnection System Maintenance." The material contained in that proposed AC is now presented in two separate ACs. Guidance for

[3] Since the comments refer to the NPRM, however, the commenters' original references are retained, including references to proposed ACs.

carrying out an EZAP analysis, as required in the new parts 25 and 26 regulations in this final rule, is presented in the newly titled No. 25-27 AC named above, which will be referred to in the rest of this document as the DAH EZAP AC. Guidance for the operator requirements will be presented in a separate 120-series AC titled "Incorporation of Electrical Wiring Interconnection System (EWIS) Instructions for Continued Airworthiness into the Operator's Maintenance Program."

For each zone on the airplane that contains wiring, DAHs must develop maintenance and inspection tasks to prevent contaminant buildup on that wiring and maintain safety. They must then make those tasks available to operators in the form of ICA readily identifiable as pertaining to wiring. They must also assess those wiring ICA in relation to ICA for fuel tank systems to make sure there are no conflicts or redundancies between the two. The rule includes requirements for the DAH to submit a compliance plan to the FAA outlining how it intends to meet these requirements.

**2. Changes to Location of Design Approval Holder Requirements**

In the NPRM, we noted that we had not decided on the final location of the continued airworthiness and safety improvements design approval holder requirements of part 25, subparts A and I. We requested comments on this issue, and received 7 comments on the rule location. Transport Canada and British Airways stated that they wanted the requirements in part 21. This was to keep the procedural requirements of the new subpart with the present procedural requirements of part 21 and out of the airworthiness standards parts of the regulations. EASA, Airbus, Boeing, Aerospace Industries Association, and the General Aviation Manufacturers Association stated that they wanted the requirements in a new part or in part 21. EASA said these requirements must be in a mandatory part of its system and CS (Certification Specifications) -25, its equivalent to our part 25, is not mandatory. Others who commented wanted to maintain part 25 as strictly an airworthiness standard.

Based on these comments and on discussions with Transport Canada, EASA, and the Brazilian Agencia Nacional de Aviacao Civil, we decided to create a new part 26 and move the

enabling regulations out of part 25 and into part 21—Certification Procedures for Products and Parts. We did this for several reasons.

First, moving these requirements to a new part keeps part 25 as strictly an airworthiness standard for new transport category airplanes. This is important because it maintains harmonization and compatibility among the United States, Canada, and the European Union regulatory systems. Second, integrating the requirements into part 21 improves the clarity of how the part 26 requirements will address existing and future design approvals.

In creating the new part 26, we renumbered the previous sections of part 25, subpart I, and we incorporated the changes discussed in this preamble. A table of this renumbering follows:

**Table 1**

**Relationship of Proposed Subpart I to Final Rules in Part 26**

| Part 26 | Part 25, Subpart I |
|---|---|
| **Subpart A-- General** | |
| § 26.1 Purpose and Scope | § 25.1801(a) Purpose and definition. |
| § 26.3 Definitions | §§ 25.1801(b) and 25.1803 |
| § 26.5 Applicability Table | New |
| **Subpart B—Enhanced Airworthiness Program for Aging Systems** | |
| § 26.11 Electrical Wiring Interconnection Systems (EWIS) Maintenance Program | § 25.1805 Electrical Wiring Interconnection Systems (EWIS) Maintenance Program |

As noted in the table above, we have added a new § 26.5 to provide an applicability table that will facilitate identifying those provisions of part 26 that apply to affected persons at any

given time. As we add subparts to part 26, we will update this table to identify the applicability of those new subparts. As with new subpart B of part 26 in this final rule, we will specify the details of applicability for each new subpart in the new subparts themselves.

**3. Interaction Between New Design Approval Holder Requirements and Part 21**

It was our intent to treat those provisions of the requirements establishing standards for design changes and revisions to the ICA as airworthiness requirements. Adding a statement to the new § 26.1(a) that the requirements of part 26 are airworthiness requirements clearly integrates these requirements with the procedures specified in part 21. The result of treating these requirements as airworthiness requirements is that any design changes that may be required by part 26 rulemaking become part of the type design of the aircraft. This makes clear that the full flexibilities allowed in part 21, such as equivalent level of safety findings and special conditions, may be applied. Also, we added § 26.1(c) to make a distinction in part 26 between type certificates and supplemental type certificates. Typically, for interpreting part 21, reference to type certificates includes supplemental type certificates unless usage of that term clearly indicates otherwise. While the usage of those terms in part 26 is contrary to the usage in part 21, we did this to make clear distinctions in requirements within part 26.

To address the change to "Special retroactive requirements" originally proposed in § 25.2(d) and to fully integrate the new rule with part 21, we made four changes to part 21. First, § 21.7 replaces proposed § 25.2(d) by establishing the applicability of continued airworthiness and safety improvement requirements. This section establishes the general applicability of part 26 to design approval holders, pending and future applicants for design approval, and type certificate holders and licensees for newly produced transport category airplanes.

While § 21.7 makes part 26 applicable to pending applications, § 21.17(a) clarifies this applicability by adding part 26 to the exception list of those requirements of the subchapter that are not established by date of application for a type certificate but by date that the type certificate is issued.

For changed products, in the case when the exceptions of § 21.101(b)(1), (2) or (3) apply, new § 21.101(g) makes clear that, even if an applicant may use an early amendment to part 25, the applicant must still comply with any applicable provisions of part 26. For each applicable part 26 provision, an applicant may elect to comply with a corresponding amendment to part 25 that is issued on or after the date of the part 26 amendment. Under the normal application of § 21.101, if the exceptions of § 21.101(b) do not apply, the applicant would be required to comply with the latest amendments of part 25 in lieu of the requirements of part 26.

Sections 21.31 and 21.50 are revised to make it clear that the Airworthiness Limitations section of the ICA is part of the type design and that changes to the ICA generated under part 26 must be made available as part of the total ICA.

These changes to part 21 do not change or add any new requirements to those proposed in the NPRM. Rather, they clarify the relationship between existing part 21 and new part 26.

**4. Compliance Dates**

Several commenters proposed changes to the DAH compliance dates for subpart I (now part 26) requirements. The proposal would have required DAHs of existing airplanes to submit ICA for approval to the FAA Oversight Office by December 16, 2007. This was based on an expected effective date of June 30, 2006 for the final rule, and would have allowed DAHs 18 months to complete compliance. The proposed operator requirements would have allowed operators 12 months from the date DAHs completed their ICA to incorporate EWIS tasks into their maintenance program. The compliance date for operators (again based on an expected final rule effective date of June 2006) was December 16, 2008.

Avions de Transport Regional (ATR), Aerospace Industries Association and General Aviation Manufacturers Association (AIA/GAMA), General Electric (GE), and Boeing requested a longer compliance time for the DAH requirements. ATR specifically proposed 30 months because it said it will need to review and update all of its maintenance documentation. GE requested 36 months. Boeing and AIA/GAMA requested the compliance time for DAHs be increased to 24 months. Boeing and AIA/GAMA noted that industry, through ATSRAC,

originally identified 24 months as the time needed to conduct the EZAP analysis for their existing airplane configurations. But the FAA has now proposed additional requirements, such as evaluating type certificate (TC) holder changes mandated by airworthiness directives (AD) and compliance plan activities. The commenters noted that the original schedule and resource analysis did not account for these additional activities. Additionally, Boeing and FedEx requested that the rule include required time periods for FAA review and approval activities involved in the compliance plans. Boeing and Airbus noted that the rules do not currently limit the amount of time the FAA will take to review and approve documents, which will negatively impact their compliance time. Boeing stated that most DAHs will require the full 90 days for developing a compliance plan, and will not initiate that plan until they obtain FAA approval. So to ensure that they have an appropriate time for compliance activities, they'll need FAA approval immediately, which is impractical.

Boeing and AIA/GAMA also said that the hard compliance dates and an expected final rule issuance in early 2007 will leave DAHs with less than 12 months to comply with the subpart I requirements. Along with Airbus and GE, they requested that we revise the compliance dates to represent a number of months after the effective date of the rule, rather than a hard date. AIA/GAMA noted that this approach would prevent our process and schedule for issuing the final rule from impacting DAH compliance dates.

We agree with the commenters that additional time should be allowed for DAH compliance with 26.11. While we understand that ICA for EWIS have already been developed for a number of affected airplanes, we also understand that not all DAHs have begun this activity. In addition, as discussed later, DAHs that have already developed EWIS ICA may not have addressed the "representative airplane" configurations, as required by this rule. However, because DAHs would need to plan and coordinate with the FAA anyway, we do not believe the requirements to do so will significantly increase the amount of time needed to comply. In consideration of these factors, we believe that 24 months will allow sufficient time for DAHs to

develop and submit the necessary compliance plan, draft data and documents, and final data and documents to show compliance with today's rule.

We have made a minor revision to sections 26.11(d)(3), (d)(4) and (d)(5). This is to clarify that the affected pending or future applicants must comply either by a date based on the effective date of the rule, or by the date of approval of the related certificate. Even though we specifically discussed the intent of these dates in the NPRM preamble, we believe that using the term "approval of the application," which appeared in the proposal (in proposed § 25.1805(c)(3), (c)(4), and (c)(5)) indicating dates for compliance, may have caused confusion. So, we have replaced the term "application" with the term "certificate" in 26.11(d)(3), (d)(4) and (d)(5).

We are not including FAA-required time periods for review and approval of the required compliance plans. Instead, expectations for FAA personnel have been defined in a new FAA order[4] that 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 DAH compliance plans, plans to correct deficiencies, and draft and final compliance data and documents. To facilitate implementation, we will also train affected personnel in their roles and responsibilities and provide in-depth familiarization with requirements of the regulations and associated guidance. The FAA's Aviation Safety organization's recent registration as an ISO (International Organization for Standardization) -9001-compliant organization will also facilitate standardized and timely implementation of the review and approval process.

Several operators also requested revisions to the DAH compliance dates, noting the potential adverse impact on them because of the time it could take for FAA review and approval. Air Transport Association (ATA) recommended that § 25.1805(c)(1) (now 26.11(d)(1)) be rewritten to provide a reasonable period of time (90 days) for the necessary FAA review and approval activities. ATA noted that the amount of time the FAA will take to review and approve

[4] Order 8110.26, "Responsibilities and Requirements for Implementing Part 26 Safety Initiatives," will be released concurrently with this rule.

TC holders' EWIS/FTS ICA could reduce operator compliance time significantly. FedEx made similar comments and noted that compliance dates should acknowledge time for approval of compliance documents, distribution of those documents, operator planning for addressing the requirements, and final release of the changes in the operator's program. Royal Dutch Airlines (KLM) was also concerned about FAA review and approval impacting operators' compliance time and requested that the operator compliance date be one year after ICA are approved. Boeing, ATR and US Airways also stated that the compliance time for the operational rules should be based on availability of needed data.

Continental requested that operators be allowed 18 months rather than 12 months to comply. It said a thorough training program would be needed for maintenance personnel not familiar with wiring and its components. This would require additional effort by the operator not contemplated by simply having ICA incorporated into a maintenance task or inspection program. Additionally, Continental stated that contract maintenance personnel must also be trained for systems they maintain.

The National Air Carrier Association (NACA) requested that operators have two years for compliance, dependent on DAHs complying with their requirements on time.

Based on rationale the ATA provided for requesting the change, we infer that ATA would like additional time (90 days) added to the operator's compliance time rather than to the DAH's compliance time. While it is inappropriate to put requirements for the FAA in a rule applicable to DAHs, we have, as discussed previously, identified expectations for FAA review and approval (including timeframes) in an internal FAA order. The length of time to review plans, data, and documents depends largely on the quality of the submittals. Acceptable documents will take less time to review.

We have structured the requirements of the DAH rule and developed complementary guidance to facilitate timely review and approval of DAH submittals (compliance planning, draft document reviews, etc.). We do agree, however, that a modest increase in operator compliance

time would help ensure that operators are not impacted by the FAA review and approval process. We have revised the EAPAS compliance date for operators from 12 months to 15 months.

Regarding the NACA request for a two-year compliance time, in the past we have imposed numerous maintenance program revision requirements through operational rules and ADs. Twelve months has been the typical compliance time for these changes and has been sufficient for operators to comply. The maintenance actions described in the maintenance program changes would be accomplished sometime later, as specified in the maintenance program. So operators will have sufficient time to plan and conduct the necessary EWIS training.

On July 30, 2004, (69 FR 45936), we extended the Fuel Tank Safety Operational Rule compliance dates to December 16, 2008, for reasons outlined in that final rule. Because of the similar timelines for operator incorporation of the FTS and EAPAS maintenance actions into their programs, we had determined that aligning the compliance dates for the FTS and EAPAS maintenance program changes would allow operators to revise their maintenance program once to address both safety initiatives. However, given delays in issuing the EAPAS rulemaking proposal and the expectation for industry to have the FTS ICA developed for compliance with the EASA rule (December 2007) and the FAA rule (December 2008), we have determined that the benefits of aligning the FTS and EAPAS compliance dates are not substantial enough to justify further delay in implementing FTS maintenance actions. As previously discussed, we are not extending the FTS operational rule compliance date in this final rule.

**5. The Design Approval Holder Compliance Plan**

As noted above, in the NPRM we contemplated submission of a proposed means of compliance, identifying all required submissions to the FAA. The NPRM proposed submission of -

- A project schedule identifying all major milestones.
- A detailed explanation of how the proposed means of compliance would be shown to comply if it differed from that described in advisory material.

- A proposal for submitting a draft of all compliance items no less than 60 days before the compliance due date.
- A proposal for how the approved ICA would be made available to affected persons (operators and others required to comply with this rule).

The proposal stated that if the FAA notified the DAH of deficiencies in its proposed compliance plan or in its implementation of that plan, the DAH must submit a corrected plan to the FAA Oversight Office within 30 days. All of these compliance plan requirements were contained in proposed § 25.1805(d) and (e).

Airbus requested that § 25.1805(d) and (e) be removed because, it said, these requirements are unnecessary. Airbus believes the only important compliance date is the final date for DAHs to submit the data and documents necessary to support operator compliance. Boeing recommended we remove the § 25.1805(d)(3) requirement to identify deviations to methods of compliance identified in FAA advisory material because it does not agree that proposed methods of compliance should be compared to other methods. Instead, it said, they should be evaluated on their own merits.

The FAA agrees that some provisions of proposed § 25.1803(d) and (e) could be removed without adversely affecting our ability to facilitate TC holder compliance. Specifically, proposed paragraph (d)(3) would require TC holders to identify intended means of compliance that differ from those described in FAA advisory materials. While this is still a desirable element of any compliance plan, we have concluded that an explicit requirement is unnecessary and it is not included in this final rule. As with normal type certification planning, we expect that TC holders will identify differences and fully discuss them with the Oversight Office early in the compliance period to ensure that these differences will ultimately not jeopardize full and timely compliance. Because we believe that timely review and approval is beneficial and will save both DAH and FAA resources, the advisory material recommends that if the DAH proposes a compliance means differing from that described in the advisory material, the DAH should provide a detailed explanation of how it will demonstrate compliance with this section. The

Oversight Office will evaluate these differences on their merits, and not by comparison with FAA advisory material.

Similarly, proposed paragraph (e) contains provisions that would have authorized the Oversight Office to identify deficiencies in a compliance plan or the TC holder's implementation of the plan and require specific corrective actions to remedy those deficiencies. While we anticipate that this process will still occur in the event of a potential non-compliance, we have concluded that it is unnecessary to adopt explicit requirements to correct deficiencies and have removed them from the final rule. Ultimately, TC holders are responsible for submitting compliant EWIS ICA by the specified date. This section retains the requirements to submit a compliance plan and to implement the approved plan. If the Oversight Office determines that the TC holder is at risk of not submitting compliant EWIS ICA by the compliance date because of deficiencies in either the compliance plan or the TC holder's implementation of the plan, the Oversight Office will document the deficiencies and request TC holder corrective action. Failure to implement proper corrective action under these circumstances, while not constituting a separate violation, will be considered in determining appropriate enforcement action if the TC holder ultimately fails to meet the requirements of this section.

Additionally, in reviewing the comment, we realized that the rule text could more clearly state our intent to allow DAHs flexibility to modify their approved plan if necessary. So the final text of proposed § 26.11(f) has been modified to read "each affected person must implement the compliance plan, <u>or later approved revisions</u> …." In response to Airbus' comment that the only important compliance date is the final date for DAHs to submit the data and documents, we must reiterate that we believe a compliance plan is important. The purpose of a 90-day compliance date for the compliance plan is to allow all parties to be informed about how the DAH will be meeting its requirements and to ensure that the all necessary data will be provided to the operators on time. Early development of a compliance plan will give assurance of development of all the necessary data in time for the operators to comply with their requirements.

**6. Defining the Representative Airplane**

Boeing requested that we define in advance of the final rule which TC holder configuration changes mandated by ADs should be considered in the EZAP. Boeing and AIA/GAMA noted that the DAH must consider airplane configurations representative of each airplane model plus DAH-developed modifications mandated by AD. Boeing stated that because ADs are applicable to operators and not DAHs, and because most ADs are not applicable to all airplanes within a specific model range, it is difficult to define a representative airplane. Boeing does not believe the proposed § 25.1805 (now § 26.11) compliance time allows enough time to properly define the representative configuration.

As previously discussed, we have increased the proposed DAH compliance time for a number of reasons, one of which was to allow sufficient time for the DAH to identify the representative configuration for each affected airplane model.

As discussed in the NPRM, the purpose of the requirement to address all TC-holder-developed modifications mandated by AD is to make the EZAP as complete and accurate as possible. It would serve no purpose to require the TC holder to analyze an airplane configuration no longer in service because an AD has mandated its modification. Therefore, TC holders must assess all these modifications to determine whether they affect the results of the EZAP. Because TC holders own the design data for both the original configurations and these modifications, they are the only entities capable of performing these assessments. When TC holders develop AD-mandated modifications for airplanes still in production, they normally incorporate these same modifications into new airplanes. So this requirement imposes little additional burden for these airplanes. At the same time, we recognize that it would be unreasonable to require the TC holder to analyze modifications developed by third parties. Accordingly, this requirement is limited to TC-holder-developed modifications.

In reviewing Boeing's comment, we recognized that the proposed definition of "representative airplane," i.e., "the configuration of each model series airplane that incorporates all variations of EWIS used on that series airplane…," could be interpreted in different ways. It

could be interpreted as applying to all post-production modifications, not just those mandated by AD and those DAH-developed modifications introduced into production. It could also refer to variations used for post-production modifications, as well as those used in production. Boeing correctly understands that we intended to require evaluation only of variations used in production and those post-production modifications mandated by AD. Section § 26.11(b) has been revised to clarify this. For those design changes made in production for which the TC holder has issued service bulletins describing post-production equivalents, the ICA should identify those service bulletins with the corresponding production configurations. This will enable operators that have incorporated these service bulletins to determine that the ICA for the production modification also applies to them.

**7. Impact on Operators**

Boeing asked that we separate the operational rule from DAH requirements, with a separate comment period, so that defined service information and associated costs can be evaluated by the operators. Boeing contended that consolidating DAH and operational requirements into one rulemaking action with one comment period prevents the FAA from obtaining accurate cost estimates and prevents operators from determining the true impact of the proposal on their operations. NACA also expressed concern that operators cannot know the full impact of this rule until DAHs develop the required ICA.

We have decided against separating the operational rules from the DAH requirements. Separating the rules would not change the technical requirements contained in this final rule but would substantially delay implementation of the EAPAS safety initiative. Thus, it is essential to include both certification and operational requirements in the final rule to ensure maximum safety benefits to the flying public.

In addition to issues of timeliness, we note that while some operators will not know the precise effects of the ICA developed by TC holders on their maintenance programs, they should have a good understanding of the nature and scope of the program from the NPRM and the guidance material provided in the DAH EZAP AC (AC No. 25-27). As discussed, both of these

were derived from ATSRAC's recommendations, which operators played a major role in developing. In addition, since 2004, multiple operators have been involved with several airplane manufacturers in developing EWIS ICA using the EZAP analysis described in the DAH EZAP AC. This has been accomplished by integrating EWIS ICA development into the airplane manufacturer's normal maintenance development program. Operators of the airplane model for which a maintenance program is being developed (or revised) are always involved in the development of that program. Therefore, these operators do know the impact of integrating these new EWIS ICA into their maintenance programs.

**8. EZAPs Already Completed**

Boeing asked that we include a statement in the final rule indicating that EZAP analyses conducted prior to the effective date of the final rule, and resultant ICA, comply with subpart I (now part 26) requirements. Boeing questioned the statement that the proposed time frames are supported by experience gained by EZAPs already performed, when the NPRM did not discuss the acceptability of those analyses. It noted that several EZAP analyses were conducted using MSG-3[5] methods, which differ slightly from those contained in proposed AC 120-XX (now the DAH EZAP AC, No. 25-27). Boeing noted that, for those cases, it must show the FAA Oversight Office how the previous analyses were conducted, make any necessary changes, obtain industry agreement, and have the FAA approve the resulting ICA.

We believe that work done before adoption of the rule will reduce the level of effort required for DAHs to comply with the rule. But we also recognize that some additional work may be necessary for DAHs to show compliance. For example, EWIS ICA may not have been aligned with FTS ICA or may not have been developed for the "representative airplane" as defined in the rule. Therefore previous work cannot automatically be considered compliant. Because we cannot say with any confidence that no more work will be required, we are not adopting Boeing's recommendation.

[5] Air Transport Association (ATA) Maintenance Steering Group 3 (MSG-3) is a document containing a logic process used by the airlines and manufacturers to develop scheduled maintenance programs for an airplane.

**9. Wire Inspections**

The National Air Traffic Controllers Association (NATCA) called the proposal inadequate because it relies on enhanced zonal inspections to detect latent failures in the wiring system, and it said that zonal inspections detect only visible deteriorated wire.

The commenter said that without periodic or real-time monitoring of airplane wiring, there is no way to predict a degraded state and prevent future wire failures. NATCA recommended that we include requirements for either continuous on-board detection of airplane wiring faults, such as that provided by system self-test features, or periodic maintenance tasks, to detect both visible and hidden degradation in the wiring system.

The requirements adopted today do not prevent use of wire monitoring or fault detection technology. Multiple non-destructive inspection (NDI) tools and real-time monitoring techniques are being developed for use in aircraft wiring inspection. However, current NDI reflectometry technology is not yet mature enough for its use to be mandated by the FAA. Although real-time monitoring technology, such as arc fault circuit breaker technology, is further along in development, it too is not yet mature enough to address all circuit types. We expect that these technologies, when available, may be relatively more expensive than conventional methods, so the need for visual inspection of EWIS would remain even if this technology were widely available. We made no change based on this comment.

**10. Protections and Cautions**

Boeing requested that we remove from subpart I (now part 26) the requirement to include ICA instructions for protection and caution information to minimize contamination and accidental damage during maintenance activities. It suggested this language should be added to the operating rule. Boeing considers the methods of protecting wiring during maintenance to be best determined by the maintenance provider and dependent on the type of maintenance activity underway. Boeing also noted that operators who have already developed protection schemes based on their experience will be required by the operational rules to replace this with the one

provided by the TC holder. Boeing does not believe this is a positive step towards increased protection of EWIS.

United Airlines stated its support for requiring airplane manufacturers to include specific recommendations for when and how to protect wire bundles from damage during different phases of maintenance.

We infer that Boeing is referring to the requirement in H25.5(a)(1)(vi). That requirement applies both to new type certificates complying with § 25.1729 (proposed as § 25.1739) and existing type certificates complying with part 26. The requirement is consistent with ATSRAC's recommendations. These recommendations were based on recognition that the TC holder will have the best understanding of EWIS material properties and vulnerabilities, and will be in the best position to identify what protection and caution measures are needed. If operators have developed their own instructions, they may be used as alternatives or as supplements to those provided by the TC holder, if approved by their Principal Inspector (PI). We have provided guidance to the FAA field offices to allow for consideration of an operator's alternative to that approved by the FAA Oversight Office. We made no rule change based on this comment.

**11. Alignment of EWIS and Fuel Tank ICA**

AIA/GAMA and GE requested that the last sentence of proposed § 25.1805(b) (now § 26.11(b)), requiring minimization of redundant requirements between EWIS and fuel tank ICA, be deleted. The commenters stated that this is an economic and customer service issue beyond the scope of the FAA's safety interest.

Boeing requested we include, within proposed § 25.1805(b), the levels of alignment of FTS and EWIS maintenance actions that will be acceptable for compliance. While Boeing sees the benefit of eliminating redundant maintenance activities, it considers itself unable to determine how to show compliance with this requirement.

Minimizing redundant requirements is not just an economic issue for operators. One of ATSRAC's findings is that repeated disturbance of EWIS during maintenance is itself a source of safety problems. Therefore, while ensuring that all necessary maintenance is performed, it is

also our objective to minimize disturbance by eliminating redundant requirements. Too frequent disturbance to electrical wiring by repeated moving, pulling, and flexing of the wire bundles will induce unnecessary stress on the wiring and its components, which in turn could lead to degradation, expedited aging, and failures. Thus it is important that redundant tasks and unnecessary disturbances to the electrical wiring be minimized. Operators will review their maintenance tasks and coordinate with the DAHs to ensure that tasks are incorporated into their maintenance program for the highest level of safety and performed in the manner most suitable for their operation.

As discussed earlier, Boeing and other TC holders have been required to develop ICA since 1981, and maintenance manuals even before that. In developing ICA, TC holders routinely review individual tasks to align them with other tasks being developed. This is done both to avoid redundancy and to eliminate confusing or conflicting instructions that could inadvertently lead to improper maintenance with unsafe consequences. The purpose of the requirement to align the ICA is no different. The intended "levels of alignment" are the same as would be expected for ICA developed in connection with original type certification. The MSG-3 and Maintenance Review Board (MRB) processes, with which Boeing and other affected TC holders are familiar, have the same objectives. The DAH EZAP AC, "Development of Transport Category Airplane Electrical Wiring Interconnection Systems Instructions for Continued Airworthiness Using an Enhanced Zonal Analysis Procedure," No. 25-27, describes means of compliance that will achieve these objectives. It provides a step-by-step process to assist applicants in compliance with the electrical wiring interconnection system (EWIS) maintenance requirements. This process includes a step requiring an analysis of the related maintenance tasks to ensure that they are consolidated and/or aligned to maximize effectiveness and eliminate redundancies and duplications between the EWIS and fuel tank ICA.

The airplane manufacturer will align the ICA requirements to the greatest extent possible. No change to the final rule is necessary.

**12. Approval of ICA**

Boeing and AIA/GAMA requested further clarification of proposed §§ 25.1739 (now § 25.1729) and 25.1805(b) (now § 26.11(b)) requirements that ICA prepared in accordance with paragraph H 25.5 of Appendix H be submitted to the FAA Oversight Office for approval. AIA/GAMA, Airbus, and FedEx recommended that EWIS ICA be accepted by the FAA, rather than approved, with the exception of any applicable airworthiness limitation items (ALI), which should be approved. The commenters were concerned that the proposed requirements are not consistent with the current requirement in § 25.1529 that ICA be found acceptable to the FAA (except for ALI, which must be approved). FedEx also stated that creation of separate "FAA-approved" ICA will lead to confusion and fragmentation of what should be an integrated inspection program.

As discussed earlier, one of the primary objectives of these DAH rules is to ensure that operators have at least one source of FAA-approved data and documents that they can use to comply with operational requirements. This objective would be defeated if the required data and documents were not, in fact, approved. Only by retaining authority to approve these materials can we ensure that they comply with applicable requirements and can be relied upon by operators to comply with operational rules. We believe that there are differences between EWIS ICA and other ICA that necessitate approval of EWIS ICA:

- EWIS ICA are the means for compliance with some of the technical requirements of new subpart H (§ 25.1707 relating to system separation and § 25.1711, component identification).
- EWIS ICA contain highly technical information such as electrical loads data and wiring practices standards that are more complex than typical maintenance instructions.
- EWIS ICA require a degree of consistency and standardization that may not be necessary for other ICA.

We agree that further clarification is needed regarding FAA Oversight Office approval of EWIS ICA. We do not intend to approve all documents that contain EWIS ICA details, such as the airplane maintenance manual. We do intend to review references in all documents that are referred to in the EWIS ICA source documents. We have made changes to the AC guidance information (AC 25.1701-1) to clarify exactly what documents the FAA Oversight Office will approve. No change to the final rule is necessary.

**13. Rule Applicability**

Today's rule is applicable to airplanes with a passenger capacity of 30 or more passengers or a payload capacity of at least 7,500 pounds operating in parts 121 and 129. NATCA requested that we consider revising the rule applicability to address all transport airplanes regardless of size or type of operation. It stated that all transport airplanes are subject to the same aging safety concerns, and passengers should have one level of safety.

The FAA has used these size criteria for the applicability of other rulemakings because they capture the airplanes carrying the vast majority of passengers and cargo. Similarly, by limiting applicability of the EAPAS operational rules to parts 121 and 129, we focus these requirements on the airplanes that transport most passengers and cargo. Based on our analysis, the additional safety benefit of extending the operational requirements to all transport airplanes would not justify the additional costs of doing so. We will continue to review this issue and, as this rule is implemented, if we can demonstrate that it can be applied cost effectively to smaller airplanes or other operators, we may consider further rulemaking.

Several commenters requested revisions and clarification of applicability with respect to supplemental type certificates (STC). EASA requested we revise the applicability of § 25.1805 (now § 26.11(d)) to include STCs that significantly affect EWIS.[6] British Airways stated its support for the existing applicability, agreeing that the analysis performed by the DAH would

[6] EASA plans to address STCs in its NPA.

cover the EWIS they are responsible for as well as the wiring changed or added by others. FedEx requested clarification on means of compliance for STCs.

Additionally, the ATA requested we revise proposed § 25.1805(c)(4) (now § 26.11(d)) to clarify its applicability only to new STCs issued after the effective date of the final rule and not to existing STCs that may be modified after the effective date of the rule. The ATA noted that some STCs are modified to expand the STC effectivity as an operator's fleet grows and should not be evaluated for compliance with § 25.1805(c)(4).

Section 26.11 will apply to future applicants for STCs and to existing TCs. As explained in the NPRM, we decided not to include existing STCs in this section for two reasons. First, most existing STCs do not provide detailed instructions for wiring installation, relying on the judgment and expertise of the individual installer. In most cases it would not be possible for the current STC holder to evaluate these wiring installations. Second, in most cases, installers have followed the TC holder's wire routing and installed STC wiring in or adjacent to existing wiring. In these cases, implementing the maintenance programs developed by the TC holder should adequately address the safety issues identified in this rule that may exist in the STC wiring. Our conclusion here is consistent with ATSRAC's recommendations.

However, we will not revise § 26.11 to exclude modifications to existing STCs. As discussed, one reason we are not applying this rule to existing STCs is that in many cases existing STCs do not include data for EWIS that can be evaluated. As discussed in the NPRM, we believe it is important that EWIS ICA be provided for all future STCs, including changes to existing STCs. We have revised § 26.11(d) to clarify that "if an existing STC is amended, this section would apply to the amendment."

The extent of the review required for changes to existing STCs would be limited to the newly proposed changes. Applicants would not be required to evaluate the entire design change approved under their existing STC. For example, if an applicant proposed to add additional monitors to an existing in-flight entertainment STC, only the EWIS supporting the additional monitors would need to be evaluated for the impact to the ICA. If an applicant were merely

adding airplane models of the same configuration to an existing STC, they would not need to evaluate their STC.

Boeing Wichita asked whether it would be required to evaluate EWIS for an entire airplane in order to comply with requirements of § 25.1805 (now § 26.11) when applying for an STC.

We do not intend to require applicants for design changes approval to evaluate the EWIS of the entire airplane. Rather, these applicants must evaluate whether their proposed design change would require revision of the ICA developed by the TC holder (and any previous STC applicants) in compliance with § 26.11 to correctly address the design change. An example would be if an STC applicant proposed to add EWIS to a zone that did not previously have EWIS. The applicant would need to develop an ICA revision providing for any maintenance actions within that zone that may be necessary to comply with Appendix H to part 25. We have revised § 26.11 by adding a new paragraph (c) to clarify this requirement.

**14. Non-U.S. Manufacturers**

Airbus also commented that proposed § 25.1805 paragraphs (b), (d), and (e) (now § 26.11(b) and (e)) fail to acknowledge that non-U.S. manufacturers will likely have to comply with similar regulations issued by their own authorities. Airbus said that discussion of the compliance plan and review of the compliance items should be delegated to the relevant foreign authority, as far as permitted by existing Bilateral Aviation Safety Agreements.

We recognize the important role other national authorities are likely to play in implementation of this rule. In addition to the on-going efforts to harmonize these requirements, we have been working closely with the other national authorities to define appropriate roles, responsibilities, and relationships among all affected authorities. As discussed in the NPRM, the compliance planning provisions are equally important for foreign TC holders, and we expect to have mutually agreeable arrangements with their authorities on how this planning will be overseen.

**15. General Comments about Design Approval Holder Requirements**

We received a number of general comments responding to the concept of DAH requirements rather than to the DAH requirements in this specific rulemaking. We responded to these types of comments in the comment disposition document accompanying our policy statement titled "Safety—A Shared Responsibility—New Direction for Addressing Airworthiness Issues for Transport Airplanes." Both were published in the Federal Register on July 12, 2005. As a result, we will not respond to such comments again here. We have included them, and our responses, in a separate document in the docket. That document is titled "General Comments about DAH Requirements Sent to Docket Number 18379"

Boeing and AIA/GAMA did not agree with our assessment that DAH rules are necessary to support this initiative. They requested we remove proposed § 25.1805 (now § 26.11) from the rule. They contended that

- the required material is neither complex nor limited to the DAH,
- operators have the option of developing an enhanced zonal inspection program without participation of the DAH, and
- operators will not be required to adopt maintenance programs developed by the DAH.

Both commenters stated that developing EWIS ICA is not complex. They noted the EZAP process is based on MSG-3 maintenance program development procedures, which are neither complex nor limited to the DAH. They believe that the DAH type design data needed for development of maintenance tasks is also available to operators.

Boeing and AIA/GAMA also said that use of the MSG-3 process by the DAH alone will only account for airplane configurations certified by the DAH and some, but not all, AD-mandated modifications. Unique configurations that evolved after delivery will not be considered by the DAH. Boeing contended that operators are capable of assessing their airplane configurations using proposed AC 120-XX (now the DAH EZAP AC) and developing an enhanced zonal inspection program without DAH involvement. Additionally, Boeing stated that

operators could develop ICA more efficiently because they could concurrently address the baseline configuration and any configuration changes made in service.

As discussed previously, the policy statement provides criteria for deciding when DAH regulations are necessary.

Appendix H paragraph H25.5(a)(1) identifies information required to perform the analysis and develop maintenance tasks. While some of this information may be available to operators without assistance from the DAH, operators would not have access to all of it.

Also, the methodology described in the AC may appear to be relatively simple, but applying it properly requires considerable expertise and judgment and can be quite complex. DAH involvement is necessary to ensure it is applied properly. We believe that DAH regulations are necessary for this safety initiative to ensure all of the representative type design configurations are addressed in a timely manner. The "representative" airplane is defined as the configuration of each model series airplane that incorporates all the variations of EWIS used on that model, and that includes all TC-holder-designed modifications mandated by AD, as of the effective date of this rule.

Existing regulations regarding ICA as adopted in Amendments 21-50 and 25-54 require DAHs to provide ICA for the airplane as a whole. This rule simply applies that same policy to EWIS, which were not specifically addressed by those amendments.

We note that in the form in which the rules were proposed, operators would be required to implement EWIS ICA based on those "developed by the type certificate holder." That statement did not clearly articulate our intent and we have corrected that language in the final rule to reference "in accordance with the provisions of Appendix H of part 25 of this chapter applicable to each affected airplane…."

Both Boeing and AIA/GAMA requested that we establish, within the final rule, all requirements for the DAHs regarding consistency, standardization of process and requirements, and technical guidelines. They do not believe the rule or guidance material is comprehensive enough to enable DAHs to comply. Boeing stated that the root cause of past difficulties with

voluntary compliance lies with unclear regulatory requirements and lack of appropriate guidance. Boeing noted that the FAA attempted to address this problem in the proposed rule, but said those attempts have fallen short of what is needed. It quoted draft AC 25-XX: "…the Compliance Team, as soon as possible after issuance of the safety initiative rule, will provide the DAHs with our expectations for the required analysis content [and] describe to the DAHs our expectations for the content and format of their data…." Boeing contends that visibility of requirements, expectations, and technical requirements would ensure uniformity of application and inform operators of what information they would receive from DAHs.

We partially agree. The program plan for the aging airplane rules was to release associated guidance and policy for public comment upon release of the NPRMs. We believe this approach should have helped clarify our expectations of what is considered an acceptable approach to compliance.

For this initiative, both the performance standards and guidance materials were developed by ATSRAC, which had representatives from the affected industry. We must presume that industry, in helping to develop these materials, understood what would be expected for new TCs. We consider these same materials to be sufficient for application to existing TCs.

The comprehensiveness and level of detail of requirements and related advisory material is at least equivalent to that for other ICA currently in Appendix H, which DAHs have successfully complied with for 25 years. The purpose of compliance planning provisions is to ensure that DAHs work closely with the FAA, as they do for initial certification, in developing compliant data and documents. We made no change to the rule due to this comment. However, we will clarify in AC 26-1 that the compliance team will meet with DAHs as soon as possible after issuance of the final rule to ensure that guidance materials and expectations related to rule implementation are clear.

**16. Airplanes Excluded from Design Approval Holder and EWIS Operating Requirements**

The DAH requirements and the EWIS requirements for operators do not apply to the following airplane models:

(1) Lockheed L-188

(2) Bombardier CL-44

(3) Mitsubishi YS-11

(4) British Aerospace BAC 1-11

(5) Concorde

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

(7) VFW-Vereinigte Flugtechnische Werk VFW-614

(8) Illyushin Aviation IL 96T

(9) Bristol Aircraft Britannia 305

(10) Handley Page Herald Type 300

(11) Avions Marcel Dassault - Breguet Aviation Mercure 100C

(12) Airbus Caravelle

(13) Lockheed L-300

The airplanes excluded from these rules are not currently operating under parts 121 or 129, so there is no need for DAHs to develop data to support the operational rules for these airplane models. The Vickers Viscount airplane appeared on this exclusion list in the NPRM. But since the Vickers Viscount was originally type certificated before January 1, 1958, this airplane is not subject to these rules because of the general exclusion of airplanes type certificated before that date. Thus it has been removed from the exclusion list. Similarly, the Convair and DC-3 models that have been modified to incorporate turbine-powered engines are also covered by this general exclusion, so they too have been removed from the originally proposed exclusion list. The Lockheed L-300 has been added to the exclusion list. There is only one qualified aircraft, which was modified, used, and later retired by the National Aeronautics and Space Administration (NASA) in 1995. It would not be cost effective to bring it into 121 operations. Thus it has been excluded from the requirements of these rules.

## C. Electrical Wiring Interconnection System (EWIS) Certification Rules (Part 25 Subpart H)

### 1. New Subpart for EWIS

This final rule creates a new subpart H within part 25 of 14 CFR addressing electrical wiring interconnection systems (EWIS). Its purpose is to be the single place in the regulations where the majority of certification rules pertaining to transport airplane wiring can be found. Many of the rules contained in this new subpart are previously-existing requirements that have been moved from different parts of the regulations. Some have been reworded to make it clear that they apply to wiring. Several of the rules in subpart H are new. As a whole, the rules in subpart H are meant to improve the safety of transport airplane wiring by making sure that it is designed to be safe. Individually, the rules address different aspects of wiring design safety, and they are discussed individually below.

To better harmonize with foreign airworthiness authorities, the numbers of many of the rules in subpart H have been changed from those originally proposed. The following table indicates the revised numbers. Since commenters referred to the proposal when they wrote to the FAA, however, their references below are the originally proposed rule numbers. Similarly, if a commenter references a proposed AC, the original draft AC number is retained, as used by the commenter. Several of the proposed subpart H rules received no comments and remain unchanged except for their numbers. Those will not be discussed here. The following table indicates the rule number changes.

**Table 2**

**Subpart H Rule Renumbering**

| Title in Subpart H | Final Rule Section | NPRM Section |
|---|---|---|
| Definition | 25.1701 | 25.1701 |
| Functions and Installation: EWIS | 25.1703 | 25.1703 |
| Systems and Functions: EWIS | 25.1705 | 25.1719 |
| System Separation: EWIS | 25.1707 | 25.1709 |
| System Safety: EWIS | 25.1709 | 25.1705 |
| Component Identification: EWIS | 25.1711 | 25.1711 |
| Fire Protection: EWIS | 25.1713 | 25.1713 |
| Electrical Bonding and Protection against Static Electricity: EWIS | 25.1715 | 25.1717 |
| Circuit Protective Devices: EWIS | 25.1717 | 25.1721 |
| Accessibility Provisions: EWIS | 25.1719 | 25.1725 |
| Protection of EWIS | 25.1721 | 25.1727 |
| Flammable Fluid Protection: EWIS | 25.1723 | 25.1729 |
| Powerplants: EWIS | 25.1725 | 25.1731 |
| Flammable fluid shutoff means: EWIS | 25.1727 | 25.1733 |
| Instructions for Continued Airworthiness – EWIS | 25.1729 | 25.1739 |
| Powerplant and APU fire detector system: EWIS | 25.1731 | 25.1737 |
| Fire detector systems, general: EWIS | 25.1733 | 25.1735 |
| [Reserved] | deleted | 25.1707 |
| [Reserved] | deleted | 25.1715 |
| Instruments using a power supply: EWIS | deleted | 25.1723 |

## 2. The Definition of EWIS (§ 25.1701)

Section 25.1701 is a new requirement. It defines electrical wiring interconnection systems (EWIS). The final rule differs from the proposal in the addition of the words "and external wiring of equipment," discussed below.

Boeing commented that EWIS is not limited to the numbered items in § 25.1701(a). EWIS components might also include terminal blocks, circuit protective devices, and contactors. Boeing requested we indicate that EWIS may include these and other items as well.

We agree with Boeing that the EWIS components listed in § 25.1701(a) are not a comprehensive list. There may be other devices that would be considered part of an EWIS, as indicated by the phrase in the lead-in sentence to the list of § 25.1701(a)(1)-(13); "…this includes:" A determination of whether a component is considered to fall under the definition of EWIS must be made on specific design details of a certification program.

Airbus commented that the phrase “and external wiring of equipment” should be added to the list in proposed § 25.1701(b) of components covered by the EWIS definition. Airbus stated that for completeness and consistency, external wiring of equipment should be considered, since it can be part of the aircraft installation (e.g., galley connection wiring and seat connection wiring). Continental asked if wire installed in seats is covered by the proposal.

We have added the phrase “and external wiring of equipment” to the list of equipment in § 25.1701(b). We consider this a clarification of what constitutes an EWIS component and not an increase in scope over the proposal. If an airplane component, such as a galley or a seat, is manufactured with connection cables external to it, then the external connection cables would be considered an EWIS component.

An individual commenter stated that the word “interconnection” in the phrase “electrical wiring interconnection systems” is redundant and should be eliminated. This commenter also requested that we cite the numerous examples of airplane electrical wiring systems that are not a part of the EWIS. This commenter further requested that we define the term EWIS in the definition section and cite examples of components included in and excluded from the system.

We do not concur with the request to remove “interconnection” from the term “electrical wiring interconnection system” (EWIS). The EWIS certification and operational requirements in the final rule apply to wires that “interconnect” airplane systems, as opposed to wiring located solely within the enclosure of a piece of avionics equipment, for example. Thus the word interconnection is integral and important in describing what electrical wiring interconnection system means.

The definition of EWIS contained in § 25.1701 does include examples of airplane wiring and its associated components that are not part of the EWIS. We believe that these examples are sufficient to adequately articulate the regulatory definition of EWIS and that further examples are unnecessary. We made no change due to this comment.

We do not agree with the commenter’s proposal to define EWIS in the definition section. Although not specifically identified by the commenter, we are assuming that he wants the

definition to appear in 14 CFR part 1. Section 25.1701 contains the EWIS definition and clearly states that the definition applies to "The Chapter." This includes all applicable certification and operational subchapters such as parts 25, 121, and 129 where the EWIS requirements are located. We have revised the final rule to include a reference to § 25.1701 in § 1.2.

Continental Airlines quoted § 25.1701 (definition) and the preamble discussion to emphasize the following statements:

> The term EWIS means any wire, wiring device, or combination of these, including termination devices, installed in the airplane for <u>transmitting electrical energy</u> between two or more termination points…
>
> …. but any electrical connection used to support power and/or <u>signal transmission</u> that is part of the airplane TC, and that is used for the laptop or other carry-on items, is covered by the proposed definition.

The commenter requested that the phrase "signal transmission" be defined.

As used in the context of the proposal, signal transmission refers to data transmitted through wired means, as opposed to wireless signal transmission.

GE and AIA/GAMA commented that proposed § 25.1701(c), which provides for exceptions to the definition of an EWIS, means that the equipment inside shelves, panels, etc. will have to show compliance with EWIS requirements even if they are qualified to the standards of Radio Technical Commission for Aeronautics (RTCA) document number RTCA/DO-160. These commenters believe this would be the opposite of the rule's intended meaning. They request that the following phrase be deleted from the final rule: "Except for the equipment indicated in paragraph (b) of this section".

As discussed in the NPRM, the definition of EWIS includes electrical wiring interconnection system components inside shelves, panels, racks, junction boxes, distribution panels, back-planes of equipment racks including circuit board back-planes, and wire integration units. This EWIS, unlike wiring within avionics equipment, is typically designed and made for a

particular airplane model or series of models. Avionics components must be sent back to their manufacturer or a specialized repair shop for service. But this type of equipment is maintained, repaired, and modified by the same personnel who maintain, repair, and modify the other EWIS in the airplane. In an electrical distribution panel system, for example, separation must be designed and maintained within the panel just as in the EWIS leading up to that panel. Identification of components inside the panel is just as important as for those outside the panel since the wiring inside the panel is treated much the same. We have retained the first sentence of proposed § 25.1701(c).

**3. Functions and Installation: EWIS (§ 25.1703)**

Section 25.1703 (whose number is unchanged from that in the proposal), is essentially derived from requirements of existing § 25.1301. It requires that applicants select EWIS components that are of a kind and design appropriate to their intended function. Factors such as the components' design limitations, functionality, and susceptibility to arc tracking and damage from moisture must be considered in selecting EWIS components.

The final rule differs from the proposal in that words were changed to clarify meaning and words inadvertently left out of the proposal were put back in. We also removed the word "adequately" in response to a comment from Boeing, as noted in the discussion elsewhere under the heading **System Separation (§ 25.1707).**

Boeing commented that proposed § 25.1703(a)(3) states that EWIS must "function properly when installed." Boeing proposed the final rule be rewritten to say that EWIS must "perform the function for which it was intended without degrading the airworthiness of the airplane."

The commenter stated that it has had difficulty in the past with the term "function properly" when applied to complex or non-essential systems. It stated the suggested revision will help clarify the regulation's intent.

We agree that in the past the term “function properly” has been applied to complex or non-essential systems in a nonstandardized manner. We have revised the final rule text as proposed.

Airbus, Boeing, General Electric, and Honeywell requested that we add the words “in the fuselage” to § 25.1703(c) so it is consistent with the original regulation, § 25.869 (a)(3). They said that this will ensure that the requirements of § 25.1703(c) are consistent with the original requirement.

We agree. We mistakenly omitted the phrase “in the fuselage” in the proposed wording. We have revised the final rule to include it.

EASA and Airbus commented that ATSRAC recommended that § 25.1703 include the following requirement:

> Electrical wiring interconnection system modifications to the original type design must be designed and installed to the same standards used by the original aircraft manufacturer or other equivalent standards acceptable to the Administrator (for 14 CFR)/authorities (for JAR).

EASA stated that this requirement will be included in the EASA notice of proposed amendment (NPA) that will propose to adopt ATSRAC’s recommendations. Airbus said such a requirement is consistent with the proposal’s preamble and advisory material (reference proposed AC 25.17XX, paragraph 5.b.(8)(b)). Airbus said that including this language in the final rule will ensure EWIS minimum compatibility for modifications made after an airplane is delivered.

Similarly, the International Aviation Safety Association (IASA) commented that airplane and wiring manufacturers should be required to approve the type of wiring used in modifications to an approved type design.

To add this additional requirement would essentially delegate to the type certificate holder authority to establish standards that go beyond the minimum safety standards required by part 25. The FAA does not have legal authority to make such a delegation. As with other

airworthiness standards, an applicant who shows compliance with our standards is entitled to design approval (reference § 21.117). The rationale for this is that our standards provide an acceptable level of safety, so exceeding them is not necessary for safety. However, the referenced advisory material does contain the following statement:

> Only the components listed in the applicable manual or approved substitutes should be used for the maintenance, repair, or modification of the aircraft. EWIS modifications to the original type design should be designed and installed to the same standards used by the original aircraft manufacturer or other equivalent standards acceptable to the FAA. This is because the manufacturer's technical choice of an EWIS component is not always driven by regulatory requirements alone. Sometimes specific technical constraints would result in the choice of a component that exceeds the minimum level required by the regulations.

We believe such a statement meets the intent of the ATSRAC recommendation. Therefore, we made no changes based on this comment.

Airbus requested that the term "hazard" replace "hazardous effects" in proposed § 25.1703(d). Airbus said this would eliminate ambiguous interpretation due to inappropriate use of what is a system safety classification term in § 25.1309(b). Airbus stated that the effect on the component itself needs to be covered instead of the effect on the function.

We infer from this comment that Airbus objects to the phrase "hazardous effects" because it believes this phrase implies that a numerical probability analysis would be necessary to show that moisture on EWIS components in known areas of moisture accumulation would not create a hazard not shown to be improbable. A numerical probability analysis is not necessary when demonstrating compliance with § 25.1703(d). The intent is that good engineering and manufacturing judgment be used when designing and installing EWIS components in areas of known moisture accumulation to minimize potential for moisture to cause an EWIS component failure. Such a failure could in turn lead to a functional failure of the system it is associated with. Or it could lead to accelerated degradation of the component and localized electrical arcing could occur. This in itself could lead to a hazardous condition. It is important to protect the

EWIS component from moisture damage. But it is the possible safety hazard from failure of the component that the rule is addressing, and not strictly the effect on the component, or its function. The advisory material for § 25.1703(d) states, in part, the following:

> This section requires that EWIS components located in areas of known moisture build-up be adequately protected to minimize moisture's hazardous effects. This is to ensure that all practical means are used to ensure damage does not occur from fluid contact with components.

We believe that this statement prevents confusion about whether or not a numerical probability analysis is required for demonstrating compliance with this requirement. It is not. We made no changes due to this comment.

Boeing and AIA/GAMA commented that the preamble discussion of § 25.1703(d) states that the rule proposes to ensure that "all practical means" are used to prevent damage due to fluid contact. They noted that one could interpret this guidance to mean that multiple means must be used. Another interpretation could be that all practical means must be considered and the most appropriate method used to address potential for fluid impinging on wiring. For purposes of clarification, Boeing requests that the term "used" be changed to "considered."

This rule is meant to require that all practical means be considered and the most appropriate method used to address potential damage from fluid contact with EWIS components. The advisory material for this requirement has been clarified to state this.

**4. Systems and Functions: EWIS (§ 25.1705)**

Section 25.1705 was proposed as § 25.1719. This section adds to the regulations the concept that EWIS associated with systems required for type certification or by operating rules must be considered an integral part of those systems and considered in showing compliance with all applicable requirements. In addition to this general requirement, the rule lists other specific certification rules (for example § 25.773 Pilot compartment view and § 25.981 Fuel tank ignition prevention) for which the applicant must include consideration of the EWIS that is part of the subject system in demonstrating compliance.

There are two differences between the proposal and the requirement as adopted: the section number has been changed, and a reference to § 25.1331(a)(2) (as discussed below) has been added.

EASA and Airbus requested that § 25.1723 be deleted and references to §§ 25.1303(b) and 25.1331(a)(2) be moved to § 25.1719 (now § 25.1705).

We partially agree to this request. There is no need to list both rules in § 25.1705(b). It is necessary to refer to § 25.1331(a)(2) because that requirement specifically applies to instruments required by § 25.1303(b). To list both §§ 25.1303(b) and 25.1331(a)(2) would be redundant. Therefore we have revised § 25.1705(b) to include 25.1331(a)(2) and we have deleted proposed § 25.1723 from the final rule.

EASA suggested that references to §§ 25.854 and 25.858 be included in § 25.1719 (now § 25.1705). The subjects of these two requirements are lavatory fire protection and cargo or baggage compartment smoke or fire detection systems, respectively. EASA stated that if we add §§ 25.854 and 25.858 to § 25.1719(b), § 25.1735 can be deleted, because its intent would be addressed in § 25.1719(a) and (b).

Requirements of § 25.1705(a) apply to EWIS associated with systems required for type certification or by operating rules. This is slightly different from those in § 25.1735, which apply to EWIS associated with any installed fire protection system, whether or not it is required for type certification or by operating rules. Therefore we cannot delete § 25.1735. We have revised it, however, to include references to §§ 25.854 and 25.858. We included these two requirements in the preamble discussion for the proposed § 25.1735 and to avoid future confusion we believe they should be referenced within the final rule.

**5. System Separation: EWIS (§ 25.1707)**

Section 25.1707 System Separation: EWIS was proposed as § 25.1709. This rule requires applicants to design EWIS with appropriate separation to minimize possibility of hazardous effects upon the airplane or its systems.

Aside from the section number change, the difference between the proposal and this final rule is that word changes have been made to clarify meaning, and the reference in paragraph (a) has been changed.

EASA commented that proposed § 25.1709 (now § 25.1707) uses the phrase "any EWIS component failure" in several places throughout the requirement. EASA believes this implies that an exhaustive list of possible EWIS component failures not related to the design under review would have to be produced. It believes this goes beyond the intent of the rule, and states that the equivalent EASA requirement will use the wording "an EWIS component failure…" as was recommended by ATSRAC. EASA recommended that the final rule language be revised to adopt ATSRAC's recommended wording.

We have made the change EASA requested. The intent of the requirement is that applicants assess all EWIS components that could have a reasonable likelihood of failing in such a manner as to create a hazardous condition. We believe the revised rule language is clearer and will not cause an applicant to unreasonably consider EWIS component failures that could not adversely impact required separation.

Boeing requested that the words "adequately" be removed from the text of proposed § 25.1703(d) (rule number unchanged) and "adequate" from § 25.1709 (a), (c), (d), (e), (f), (g), (k), and (l) (§ 25.1709 is now § 25.1707). Boeing contends that inclusion of these terms does not enhance interpretation of the rules. It requested that we either delete them or add performance criteria that define the term "adequate."

We believe the word "adequate" is necessary to the intent of § 25.1707. Paragraph (a) of that section provides objective criteria outlining how adequate physical separation must be achieved. We have also described various means of providing adequate physical separation in the associated advisory material. Because each system design and airplane model can be unique, and because manufacturers have differing design standards and installation techniques, § 25.1707 does not mandate specific separation distances. The advisory material provides the

criteria each airplane manufacturer should consider when developing adequate physical separation for EWIS. These criteria include the following factors:

- The electrical characteristics, amount of power, and severity of failure condition of the system functions performed by the signals in the EWIS and adjacent EWIS.
- Installation design features, including the number, type, and location of support devices along the wire path.
- The maximum amount of slack wire resulting from wire bundle build tolerances and other wire bundle manufacturing variabilities.
- Probable variations in the installation of the wiring and adjacent wiring, including position of wire support devices and amount of wire slack possible.
- The intended operating environment, including amount of deflection or relative movement possible and the effect of failure of a wire support or other separation means.
- Maintenance practices as defined by the airplane manufacturer's standard wiring practices manual and the ICA required by § 25.1529 and § 25.1729.
- The maximum temperature generated by adjacent wire/wire bundles during normal and fault conditions.
- Possible electromagnetic interference, high intensity radiated fields, or induced lightning effects.

Although not related to this comment, we believe that the requirements of § 25.1707(c) could be stated more clearly. We have revised § 25.1707(c) in the final rule to state that

> …damage to circuits associated with essential functions will be minimized under fault conditions.

We have removed the word "adequately" from § 25.1703(d). As used in proposed § 25.1703(d), that word does not add clarity to the requirement's intent and is therefore unnecessary.

GE suggested that for clarification we revise proposed § 25.1709(l) (now § 25.1707(l)) to read as follows:

> **§ 25.1709(l)** Each EWIS must be designed and installed so there is adequate separation between it and **other** aircraft **components**, in order to prevent abrasion/chafing, vibration damage, and other types of mechanical damage

We agree with GE that the wording of this rule could be improved to help clarify its requirements. We have revised § 25.1707(l) to state that

> . . . EWIS must be designed and installed so there is adequate physical separation between it and other aircraft components and aircraft structure, and so that the EWIS is protected from sharp edges and corners, to minimize potential for abrasion/chafing, vibration damage, and other types of mechanical damage.

Boeing requested that the reference to § 25.1309(b)(1) and (b)(2) in § 25.1709(a) (now § 25.1707(a)) be deleted. It commented that the applicable guidance material does not include a numerical probability analysis. EASA commented that proposed § 25.1709(a) limits applicability of § 25.1309 to EWIS addressed by subparagraphs (b)(1) and (b)(2). EASA believes that for administrative purposes the final § 25.1709(a) should simply reference § 25.1309 because § 25.1309 could be revised in the future or the requirements of those paragraphs could be moved to a different paragraph within § 25.1309, making it necessary to also change § 25.1709. It stated that the equivalent EASA requirement will just reference § 25.1309.

We agree with Boeing's request to delete the reference to § 25.1309(b)(1) and (b)(2) and do not agree with EASA's request to modify the reference. The intent of the reference to failure

conditions as defined by § 25.1309(b)(1) and (b)(2) was to require that an EWIS, under normal and failure conditions, would not create an unsafe condition. The failure conditions we were intending to reference are “hazardous” or “catastrophic,” used in EASA CS-25.1309 and in § 25.1709. In reviewing the text of the proposal, however, we realized that this reference could cause confusion as to the intent of the requirement and that the reference to the “catastrophic” failure condition is not necessary for the purposes of this requirement. To better align the requirement of paragraph (a) with the requirements of paragraphs (e) through (j), and to ensure adequate separation between EWIS and other airplane systems not specifically addressed by those paragraphs and paragraph (k), we have revised the first sentence of 25.1707(a). That sentence now reads: “Each EWIS must be designed and installed with adequate physical separation from other EWIS and airplane systems so that an EWIS component failure will not create a hazardous condition.” We discuss the term “hazardous condition” in our response to the next two comments.

General Electric and Honeywell commented that the wording of § 25.1709 (now § 25.1707) should be revised to clarify the meaning of “hazardous conditions,” so that a contained and detectable engine nacelle or auxiliary power unit (APU) enclosure fire is clearly distinguished from a fire within the pressurized fuselage as not being hazardous. In a similar comment, Airbus requested that the language for § 25.1709(b) (now § 25.1707(b)) be revised to reflect the original ATSRAC recommendation as follows:

> Each EWIS must be designed and installed so that any electrical interference likely to be present in the airplane will not result in hazardous effects upon the airplane or its systems unless shown to be extremely remote.

Airbus stated that the ATSRAC-proposed words "unless shown be to extremely remote," should not be removed unless it can be interpreted that the word "likely" excludes cases that are extremely remote and this is expressed in the advisory material.

In our NPRM preamble discussion of this issue, we said that the phrase "hazardous condition" in § 25.1709 (now § 25.1707) is used in a different context than it is when associated with the EWIS safety analysis requirements of § 25.1705 (now § 25.1709.) While that statement remains true, we now realize that framing the discussion around what a hazardous condition means in different rules may have caused confusion. The meaning of the term "hazardous condition" remains the same, whether used in § 25.1707, in § 25.1709, in current § 25.1353, or in CS 25.1309. Here is the definition for a hazardous failure condition, and also for a catastrophic failure condition.

Hazardous Failure Condition:

Failure condition that would reduce the capability of the airplane or the ability of the flightcrew to cope with adverse operating conditions to the extent that there would be, for example:

- a large reduction in safety margins or functional capabilities; or
- physical distress or excessive workload such that the flightcrew cannot be relied upon to perform their tasks accurately or completely; or
- serious or fatal injuries to a relatively small number of persons other than the flightcrew.

Catastrophic Failure Condition:

Failure condition that would result in multiple fatalities, usually with the loss of the airplane.

Hazardous and catastrophic failure conditions are descriptive terms for situations that could occur in the airplane because of failures (safety margins reduced, the flightcrew unable to perform accurately because of adverse operating conditions, injuries to passengers, etc.). These are situations that result from unsafe conditions and must be avoided. Therefore, when an airplane is certified, the applicant must show that the kinds of failures that could result in these kinds of situations have been considered, and measures put in place to prevent them.

In the System Separation rule, § 25.1707, separation distances or a barrier must be used to ensure that none of the types of failures described in the rule will create a situation that would fit the definition of a hazardous condition. The operative term in this rule is that such failures

**will not create a hazardous condition**. To show that a given failure, such as fuel leakage onto EWIS components, will not create a hazardous condition, the applicant may use a qualitative analysis, consisting of expert engineering judgment, manufacturing judgment, and an assessment of any relevant service history.

In the EWIS System Safety rule, § 25.1709, the applicant must show that each EWIS system is designed and installed so that each hazardous failure condition **is extremely remote**. The definition of a hazardous failure condition remains the same. In this rule, however, a numerical probability is required to demonstrate that the possibility for such an occurrence is extremely remote.

Section § 25.1709 uses both the terms "hazardous" and "catastrophic" and says that the applicant must not only show that each hazardous failure condition is extremely remote, but that each catastrophic failure condition is extremely improbable and does not result from a single failure. This would normally require a combination of qualitative and quantitative analyses to demonstrate compliance.

The requirements of § 25.1707 do not preclude use of valid component failure rates if the applicant chooses to use a probability argument in addition to the design assessment to demonstrate compliance. It also does not preclude the FAA from requiring such an analysis if the applicant cannot adequately demonstrate that hazardous conditions will be prevented solely by using the qualitative design assessment. However, we did not include the words "unless shown to be extremely remote" in § 25.1707 because we did not want to imply that a numerical probability assessment was required to comply with this rule.

The engine nacelles and APU enclosures are designated as fire zones and this is taken into account in the design and installation of EWIS in those areas. But we do not agree with GE and Honeywell that a fire in the engine nacelle or APU enclosure could never create a hazardous condition. There is always the possibility that the fire could not be suppressed and could result in a safety hazard. We made no changes because of these comments.

The National Air Carrier Association (NACA) commented that the proposed EWIS system separation requirements in § 25.1709 (now § 25.1707) are necessary for new aircraft. However, it said that imposing these requirements and those of § 25.1711 on existing airplanes would be a significant economic burden.

The separation and identification requirements of §§ 25.1707 and 25.1711 are applicable to new designs and do not apply to previously certified products.

In a comment relating to proposed § 25.1709 (now § 25.1707), IASA requested that specific mention be made of wiring that is required to regularly flex in position (such as that in doors and hatches).

We agree that designers and installers should address the additional stresses placed on wires and cables that are required to regularly flex, such as those in doors and hatches. We have revised the advisory material for §§ 25.1703 and 25.1709 to reflect this. However we do not concur that a change to § 25.1707 is necessary. As stated, these requirements are performance based. Applicants would have to demonstrate that any wiring required to regularly flex in operation would be able to maintain its designed separation distance from other EWIS, components, or airplane structure as applicable.

Boeing and GE requested that we clarify § 25.1709(d) (now § 25.1707(d)). They asked whether an "independent airplane power source" is considered to be an airplane level power source as is related to an APU, battery, etc., or whether it is <u>any</u> power source that transmits power. If it is the latter, they recommended that there be some differentiation in the associated guidance material for the differences between ground blocks and ground studs, and for the differences between static grounds terminating at ground blocks and ground studs. The commenters did not consider ground blocks "a common terminating location" for non-redundant grounds.

As used in § 25.1707(d), "independent airplane power sources" means a general source of power for the whole of the airplane or for major subsystems (such as the permanent magnet

generators that provide power for fly-by-wire systems ). Examples include engine- or APU-driven generators, batteries, and ram air turbines. We have revised the AC to reflect this.

GE requested that the word "physical" be deleted from the text of § 25.1709(d) (now § 25.1707(d)). It stated that adequate separation should be all that is required and that using physical separation is only one means of achieving this.

The FAA believes that the word "physical" is necessary, as recommended by ATSRAC, to ensure that necessary separation is not achieved solely by electrical isolation and use of control logic via hardware or software implementation. We made no changes due to this comment.

Airbus requested that the phrase "will not create a hazardous condition" be replaced by the phrase "will not create a hazard" in proposed § 25.1709 (e), (f), (g), (h), (i), and (j) (proposed § 25.1709 is now § 25.1707). Airbus commented that this would eliminate ambiguous interpretation from inappropriate use of what is a system safety classification term used in § 25.1309(b).

We believe the word "hazard" is ambiguous and could cause confusion in the context of the requirement. We believe that the preamble discussion in the NPRM (which refers to this rule as § 25.1709), the additional clarification given in this final rule, and the advisory material for final § 25.1707 clearly articulate what is meant by the term "hazardous condition."

**6. System Safety: EWIS (§ 25.1709)**

This rule requires applicants to perform a system safety assessment of the EWIS on their airplane. The current regulation requiring system safety assessment for certification is § 25.1309. But current § 25.1309 only covers systems and equipment that are "required by this subchapter," and wiring for non-required systems is sometimes ignored. The objective of new § 25.1709 is to apply the concepts of § 25.1309 to all wiring.

The safety assessment required by § 25.1709 must consider effects that both physical and functional failures of EWIS would have on the airplane's safety. Based on that safety assessment, the applicant must show that each EWIS failure considered to be hazardous is

extremely remote. Each EWIS failure considered to be catastrophic must be shown to be extremely improbable and may not result from a single failure.

This rule was proposed as § 25.1705. That number has been changed to § 25.1709, to harmonize with foreign airworthiness authorities. With the exception of that number change, this rule remains unchanged from the form in which it was proposed.

Airbus suggested that use of the words "extremely remote" and "extremely improbable" should be avoided. It pointed out that the preamble discussion for § 25.1705 (now § 25.1709) is based on a qualitative approach and this was the basis of ATSRAC's recommendation. Airbus said that no calculated number should be necessary for compliance with this rule. It also said, with reference to the NPRM preamble discussion, that "jamming" cannot be a justification for creating § 25.1705 because an EWIS cannot cause flight control surface or pilot controls jamming.

The analysis required by § 25.1709 is not purely a qualitative assessment of the effects of EWIS failures. Nor was this the basis of the ATSRAC recommendation. The analysis required by § 25.1709 is based on a qualitative and quantitative approach to assessing EWIS safety, as opposed to a purely numerical, probability-based quantitative analysis. This is consistent with existing § 25.1309 assessments, where a qualitative analysis is always necessary, and the quantitative probability analysis is a means of compliance for the hazardous and catastrophic failure conditions.

Section 25.1709 is based on the recommendation from ATSRAC. The § 25.1709 safety assessment must consider effects that both physical and functional failures of EWIS would have on airplane safety. The physical analysis is meant to be a qualitative assessment and its results are to be integrated into the analysis required by § 25.1309 (or other required assessments such as § 25.671 as applicable), which is both a qualitative and quantitative assessment.

In response to Airbus's comment that creation of EWIS requirements should not be predicated on flight control surface or pilot controls jamming, the NPRM preamble reference is in the context of explaining that certain airplane systems are exempt from § 25.1309. EWIS

associated with those exempt systems are thus also excluded, even though those EWIS could create hazardous conditions in the same way as any other EWIS. As a result, there is a need for a requirement to address all the EWIS on an airplane. We made no changes based on these comments.

While acknowledging that the aim of proposed § 25.1705 (now § 25.1709) is to make the requirements of § 25.1309 more explicitly applicable to EWIS, Airbus requested that the text of this rule be revised to read as follows:

> Each EWIS must be designed and installed so it does not lead to a catastrophic failure condition as a consequence of a single EWIS failure. EWIS failure should be understood as failure affecting from one to all EWIS components within a single bundle.

Airbus's rationale for this change is based on the originally estimated 32.8 accidents that adoption of the proposed rules will prevent over the next 25 years. When combined with the number of airplanes projected to be in service and their combined operating hours, the probability of an EWIS causing a hazardous or catastrophic failure condition will be less than is required to demonstrate compliance with § 25.1709. The commenter contended that if this rationale is accepted by the FAA, then all an applicant should have to do is show in a qualitative manner that an airplane's EWIS will not be the cause of a catastrophic event.

The purpose of § 25.1709 is to ensure that the same analytical rigor applied to other systems for compliance with § 25.1309 is applied to EWIS. That is why the proposal specified the same criteria as § 25.1309(b). Airbus's request would impose lesser criteria for analysis of EWIS, even though the consequences of EWIS failures may be just as severe as any other system failures. Airbus's justification for its request relies on the estimated numbers of incidents in the initial regulatory evaluation and an apparent assumption that this number would meet the computed risk threshold required by § 25.1309. This is not the case. The analytical methods used for an economic evaluation are very different from methods required for risk assessment by § 25.1309 (or § 25.1709). The regulatory evaluation is a projected incident rate based on

historical data. Estimating possible failures for compliance requires a detailed evaluation of the modes and effects of potential failures in a specific system design. We made no change because of this comment.

Boeing requested that proposed § 25.1705 (now § 25.1709) be included as a reference within § 25.1309(b) as previously proposed by industry. Boeing stated that duplicating the regulations leaves open the possibility of deviations in application. GE commented that proposed § 25.1705 is not acceptable. It said the discussion of this proposal, and the accompanying AC, contain several misstatements regarding current use and means of compliance with § 25.1309. According to GE, this misunderstanding of § 25.1309 has led to a perception by the FAA that a new rule is needed, when in fact, § 25.1309 already addresses the area of concern. The NPRM preamble states that § 25.1309 does not address single wire chafing or arcing as a cause of failure: "the physical portion has been neglected in past system safety analyses." GE contended this is not true, because § 25.1309 safety assessments have addressed wiring failures as sources of fire. GE recommended that proposed § 25.1705 be removed. It suggested that the AC material for proposed § 25.1705 be provided to ARAC for incorporation into the § 25.1309 AC.

As stated in the preamble discussion of the NPRM, and in its related draft advisory material, the § 25.1709 analysis may be accomplished in conjunction with § 25.1309 assessments. Having a separate requirement for EWIS safety assessments will ensure that all airplane EWIS are assessed for potential impact on safe operation. This cannot be accomplished if § 25.1709 is simply included as a reference in § 25.1309. Nor can we delete § 25.1709 and incorporate its means of compliance into future versions of advisory material for § 25.1309, as GE suggests. As discussed in the NPRM, the requirements of § 25.1709 are necessary. Current safety analysis practice has been proven – by accidents and service history – to be insufficient with respect to safety assessments of wire designs and installations, including wire failures that can cause fires. The requirements of § 25.1709 are such that they complement those of § 25.1309 and address its shortcomings when it comes to safety assessments of EWIS. Section

25.1309 does not allow any single failure to result in catastrophic consequences, regardless of the failure probability. The requirements of § 25.1709 are consistent with those of § 25.1309. We made no changes due to these comments.

Federal Express referred to this statement in the preamble discussion of proposed § 25.1705 (now § 25.1709):

> If this information [what systems and functions the other wires in the same and surrounding bundles support] is not available to the modifier, then the EWIS system must be designed to accommodate this lack of knowledge….

FedEx said this would typically mean that wire being added for the modification would need to be routed separately from existing airplane wiring. It requested that, prior to adoption of this concept into any advisory material or design standard, detailed guidance on separation in confined areas such as equipment racks or breaker panels be developed.

We believe that the advisory material for post-TC modifications provides clear guidance for the case cited by Federal Express. When separation cannot be maintained because of physical constraints (in terminal strips and connectors, for instance), the applicant should conduct the appropriate analysis to show that no adverse failure conditions result from sharing the common device. This analysis requires knowledge of the systems or system functions sharing that device (again, the example would be terminal strips and connectors). If a modifier cannot identify the systems or system functions in the congested area, then the new EWIS would have to be routed through a different area if an acceptable alternative method of providing adequate separation is not provided. We made no changes to the final rule because of this comment. However, we have expanded the final advisory material for this requirement to provide clear guidance on the specific scenario contained in FedEx's comment.

Boeing commented on the part of the § 25.1705 (now § 25.1709) discussion in the NPRM that states that an in-flight entertainment (IFE) system installed on an airplane with subpart H as part of its type certification basis would be subjected to a more rigorous safety

assessment. Boeing noted its understanding that subpart H is applied to applicants for type certificates, amended type certificates, and supplemental type certificates. It asked whether it is correct that "an application for that or another IFE system to be installed on any airplane following the implementation of subpart H would be subjected to a more rigorous safety assessment."

Boeing asked whether an existing STC applicable to an existing airplane model, applied to a new airplane of the same model but with subpart H as part of its certification basis, would be subjected to requirements of subpart H. It referred to the statement in the NPRM that post-type certificate modifications have repeatedly introduced wiring safety problems. Boeing asked for clarification of whether an existing amended or supplemental type certificate would be subjected to subpart H requirements prior to installation on an airplane with or without subpart H as its basis of certification.

In the case of a previously certified IFE system being considered for installation on an airplane model with subpart H in its certification basis, the answer is yes. The IFE system would have to be certified to the EWIS requirements of subpart H. To do otherwise could compromise the safety of the airplane by applying a lesser certification standard to the IFE system. After the effective date of the final rule, if a modification is proposed for an existing airplane model without subpart H in its certification basis, whether or not the modification will need to have subpart H in its certification basis will be decided on a case-by-case basis, and the requirements of § 21.101, Designation of applicable regulations, will apply.

**7. Component Identification: EWIS (§ 25.1711)**

This rule requires applicants to identify EWIS components using consistent methods that facilitate easy identification of the component, its function, and its design limitations. For EWIS associated with flight-essential functions, identification of the EWIS separation requirement is also required.

The number of this rule remains unchanged from its number as proposed. In response to comment, we have revised wording to clarify its intent, as discussed below.

Boeing requested that we clarify § 25.1711(a) by revising it as follows:

> EWIS components must be labeled or otherwise identified using a consistent method that facilitates identification of the wire EWIS component, its function, and its design limitations, if any.

GE requested we revise the same paragraph to read as follows:

> EWIS components must be labeled or otherwise identified using a consistent method that facilitates identification.

Boeing and GE also requested that we remove the requirement in §25.1711(b) that, for systems requiring redundancy, components must be identified with component part number, function, and separation requirement for bundles. They stated that all wiring should be treated with the same level of care. The commenters contended that as the proposed requirement was written, the regulation was impractical to implement, since there are many redundancy separation categories in the aircraft. A given bundle might have different separation requirements from multiple other bundles, from hydraulic systems, and from air ducts, and the requirement could vary with axial distance along the fuselage. There would not be room to add all this data to the bundle label.

We have clarified § 25.1711(a) as requested by Boeing. It is the intent of this rule to require identification of all EWIS components and not just the wire (which is one component of an EWIS). We have revised that section by replacing the word "wire" with the phrase "EWIS component."

We have decided against deleting the phrase "of the wire, its function, and its design limitations, if any" from § 25.1711(a). It is important that the EWIS component's function and design limitation information be easily and readily available to maintainers and future modifiers. Labeling components with this information will help ensure that the level of safety provided by the original design is not degraded. It will also prevent potential safety hazards from improper

maintenance and from replacement of original parts with parts not designed or intended for that particular use.

We have also decided against deleting §25.1711(b). We agree that all wiring must be treated with care. But we are especially concerned that wires and other EWIS components associated with flight-essential or flight-critical systems be easily identifiable by those designing and installing modifications, as well as by technicians performing maintenance or repair. If a wire bundle has different separation requirements as it is routed throughout the airplane, then those varying separation requirements must be identified on the bundle at the appropriate location where a particular separation requirement is applicable. It would not be necessary to have each label on the bundle contain all the differing separation requirements.

IASA suggested that using a color-coding approach to identifying critical systems would help post-TC modifiers easily identify critical airplane systems. We agree with the need to help ensure easy identification of these systems so that post-TC modifications and repairs do not inadvertently introduce unintended failure modes. However, the EWIS identification requirements of § 25.1711 do not prescribe the means by which EWIS is identified. It only requires that the identification scheme be consistent throughout the airplane and that modifications follow the same scheme. Color coding of EWIS may be an acceptable means to comply with the requirements. We made no changes because of this comment.

US Airways stated that mandating identification for all terminals, switches, connectors, or any component mounted in an area with limited space could cause tags or something similar to be used. These would in turn become contaminants.

We agree that some EWIS components may be so small that it would be impractical to label the component directly with textual data, and that excessive use of tags could become a source of future contamination. However, § 25.1711 states that other means of identification can be used if the component cannot be physically marked. For example, the manufacturer's consistent marking scheme may be such that a color code is used to mark these types of components. Applicants will have to collaborate with their FAA Aircraft Certification Office to

work out the details. The method of identification is not mandated by the rule. It is left up to the applicant to propose a method of identification. We made no changes based on this comment.

**8. Fire Protection: EWIS (§ 25.1713)**

This rule requires that EWIS components meet the applicable fire and smoke protection requirements of § 25.831(c). It further requires that EWIS located in designated fire zones be fire resistant. Insulation on electrical wires and cables is required to be self-extinguishing when tested in accordance with the applicable portions of Appendix F, part 1, of part 25. Section § 25.1713 is adopted as proposed, except that we removed the phrase "at least" that preceded "fire resistant."

EASA and Airbus commented that § 25.1713(a) should also reference § 25.863. Airbus stated that this reference is common practice for fire protection compliance demonstration for EWIS components. EASA stated that the equivalent EASA requirement, CS 25.1713, will reference CS 25.863.

Because § 25.1723 already requires EWIS components to meet requirements of § 25.863, it is not necessary to state the same requirement in § 25.1713.

Boeing commented that proposed § 25.1713(c) repeats and replaces § 25.869(a)(4), except with the change underlined below:

> (c) Insulation on electrical wire and electrical cable, <u>and materials used to provide additional protection for the wire and cable,</u> installed in any area...

Boeing requested that we change § 25.1713(c) and/or Appendix F to Part 25 to clarify which test article configurations (test components individually or test components installed on the wire), and which flammability tests are required for "materials used to provide additional protection for the wire and cable."

Boeing noted that Appendix F only refers to electrical conduit. It said the rule is clear on how electrical conduit and insulation on wire must be tested, but not on how to test the "materials used to provide additional protection for the wire and cable."

Boeing said that the rules should make clear what testing is required for materials such as tight fitting protective sleeve ( heat shrinkable material, for example), loose fitting protective sleeve (such as spiral wrap or Varglas), or, for that matter, clamps, grommets installed in holes, or other devices used to protect wire and cable.

We have not revised § 25.1713(c) and/or Appendix F because we believe the requirements of § 25.1713(c) are clear and unambiguous. A material used to protect wire such as heat shrinkable material, or loose fitting protective sleeving such as spiral wrap or Varglas, must be tested in accordance with the requirements of part 25, Appendix F, part I, in the same manner as electrical wire is tested. As stated in Appendix F, Part 1(a)(v), it is not necessary to test small parts such as clamps and grommets because they would not contribute significantly to the propagation of a fire.

**9. Electrical Bonding and Protection against Static Electricity: EWIS (§ 25.1715)**

Section 25.1715 requires that EWIS used for electrical bonding and protection against static electricity meet the requirements of § 25.899. It requires that EWIS components used for any electrical bonding purposes (not just those used for protection against static electricity) provide an adequate electrical return path under both normal and fault conditions.

Section 25.1715 was proposed as § 25.1717. Its number was changed to better harmonize with foreign airworthiness authorities. In response to comments, we have revised the wording of §25.1715 and expanded it to clarify meaning, as discussed below.

Boeing stated that the term “adequate electrical return path” as used in § 25.1717 (now § 25.1715) is difficult to define, and should be replaced with performance criteria, such as the following:

> On airplanes having grounded electrical systems, electrical bonding provided by EWIS components must provide an electrical return path capable of carrying both normal and fault currents without creating a shock hazard.

GE requested clarification of what constitutes a fault condition for compliance with proposed § 25.1717. It asked if a fault condition includes failure of the bonding path, such as physical breakage.

We have revised § 25.1715 as requested by Boeing but have added the phrase "or damage to the EWIS components, other airplane system components, or airplane structure." to the end of the suggested revision.

In response to GE's comment, the intent of the requirement is to ensure that the current return paths are sized so they can accommodate fault currents due to component failure. One example would be shorted integrated drive generator power feeder cables where electrical bonding is used for the fault current path.

**10. Accessibility Provisions: EWIS (§ 25.1719)**

This rule requires access be provided to allow for inspection of EWIS and replacement of their components, as necessary for continued airworthiness.

Section 25.1719 was proposed as § 25.1725. Its number has been changed to facilitate harmonization. No other changes have been made.

EASA and Airbus commented that the wording of proposed § 25.1725 (now § 25.1719) is slightly different from that recommended by ATSRAC. ATSRAC recommended that it state:

> Means must be provided to allow for inspection of EWIS and the replacement of its components as necessary for continued airworthiness.

The NPRM proposed § 25.1725 to read as:

> Access must be provided to allow inspection and replacement of any EWIS component as necessary for continued airworthiness.

Airbus said that the word "access" is ambiguous. For example, it said, it is almost impossible to access the inside of a conduit. US Airways noted that the rule needs to be revised because there are areas where access to cables and wire runs is not possible.

EASA suggested we change the rule to ATSRAC's original wording and stated that it will use this wording in its equivalent requirement, CS 25.1719.

We have decided to retain the wording of this requirement as proposed. However, it should be noted that it is not the intent of the rule to require human physical access in all cases. If such access is not possible because of physical design, then other inspection techniques could be allowed, such as use of a remote optical device. However, in response to US Airways' statement, § 25.1719 does require that access be provided to allow for inspection and replacement for any EWIS component if it is necessary for continued airworthiness. Therefore there will not be areas where EWIS components are inaccessible for airplanes with § 25.1719 in their type certification basis.

We have revised AC 25-1701-1 to reflect the fact that other types of inspection techniques could be approved when human physical access is not possible. Other types of emerging inspection techniques may not require physical access.

**11. Protection of EWIS (§ 25.1721)**

Section 25.1721 requires that cargo or baggage compartments not contain any EWIS whose failure would adversely affect safe operation. It also requires that all EWIS be protected from damage by movement of people and from damage from items carried on the airplane by passengers or cabin crew.

Section 25.1721 was proposed as § 25.1727. Its rule number was changed to harmonize with regulations of foreign airworthiness authorities. No other changes have been made.

Boeing suggested that this rule be revised to state that EWIS should be protected so it "... cannot be damaged by normal movement of cargo or baggage in the compartment." It said this change will clarify requirements. Boeing, GE, and AIA/GAMA stated that maintenance personnel need to be trained in proper EWIS handling.

We have decided against revising § 25.1721 in the manner Boeing suggests. This requirement is not limited to "normal movement." EWIS in cargo or baggage compartments must be designed and installed so it is protected in both normal and non-normal situations, such

as when cargo containers come loose and strike compartment walls during flight because of cargo system malfunctions.

We agree that training personnel in proper handling of EWIS is also necessary. Although we have not mandated this training, except for technicians and inspectors working directly with EWIS, we have outlined a training program for a wide variety of personnel who work on airplanes. This training program is outlined in Advisory Circular 120-YY, Aircraft Electrical Wiring Interconnection Systems Training Program. We made no changes due to these comments.

GE requested that the phrase "risk of damage" be deleted from proposed § 25.1727 (now § 25.1721). It stated that risk of damage implies control of the failure effect of damage that is assumed to occur, as in § 25.901(c). It said that because 14 CFR § 25.1309 already adequately controls the relationship between probability of a failure condition and its effect, risk of damage should be deleted from proposed § 25.1727.

We believe it is necessary to address both damage and risk of damage. Design and installation must be such that they preclude damage to EWIS to the extent possible when all design and installation factors are considered. We recognize, however, that it is not always possible to prevent possible damage because of design or installation considerations. EWIS components should be robust enough to minimize the damage that could occur if they come into contact with cargo, baggage, or personnel. We made no changes due to this comment.

**12. Flammable Fluid Shutoff Means: EWIS (§ 25.1727)**

Section 25.1727 requires that EWIS associated with each flammable fluid shutoff means and control be "fireproof" (as defined in § 1.1) or located and protected so that any fire in a fire zone will not affect operation of the flammable fluid shutoff means, in accordance with § 25.1189.

Section 25.1727 was originally proposed as § 25.1733. We have changed its number to facilitate harmonization with foreign airworthiness authorities. No other changes have been made.

Boeing recommended that the word “fireproof” in § 25.1733 (now § 25.1727) be replaced with “fire resistant”’ to be consistent with terminology used in § 25.869(a) and proposed § 25.1735 (now § 25.1733). AIA/GAMA stated that fire resistant and fireproof are not synonymous.

AIA/GAMA is correct. “Fire proof” is a more stringent standard than “fire retardant.” The basis for proposed § 25.1727 is the requirement of § 25.1189(d) that “each flammable fluid shutoff means and control must be fireproof or must be located and protected so that any fire in a fire zone will not affect its operation.”

To ensure the effectiveness of flammable fluid shutoff means and controls, the requirement for EWIS associated with those systems must be as stringent as the requirement for other components of those systems.

**13. Powerplant and APU Fire Detection System: EWIS (§ 25.1731)**

This rule requires that EWIS that are part of a fire or overheat detector system located in a fire zone be fire resistant, as defined in § 1.1. It also requires that EWIS components of any fire or overheat detector system for any fire zone may not pass through another fire zone unless:

- They are protected against the possibility of false warning caused by fire in the zone through which they pass, or
- Each zone involved is simultaneously protected by the same detector or extinguishing system.

This rule also requires that EWIS that are part of a fire or overheat detector system in a fire zone meet requirements of § 25.1203. Section 25.1203 requires approved, quick acting, fire or overheat detectors in each designated fire zone, and in the combustion, turbine, and tailpipe sections of turbine engine installations, to provide prompt indication of fire in those zones.

Section 25.1731 was originally proposed as § 25.1737. Its number was changed for purposes of harmonization. No other changes have been made.

EASA requested that the reference to § 25.1203 be moved to § 25.1719 (now § 25.1705 Systems and Functions: EWIS).

The intent of § 25.1731 is to ensure that any EWIS components associated with powerplant and auxiliary power units' fire detector systems be as robust and fire resistant as the other components making up these systems. The requirements of § 25.1731 are based on those contained in § 25.1203. It could create confusion if the requirements in § 25.1731 were split between two separate subpart H regulations as requested by EASA. Therefore we have retained the originally proposed § 25.1731 in this final rule.

**14. Fire Detector Systems, General: EWIS (§ 25.1733)**

Section 25.1733 requires that EWIS associated with any installed fire protection system be considered in showing compliance with the applicable requirements for that particular system. This is a new requirement that has not previously existed in part 25. Current part 25 regulations contain fire detection system requirements for powerplants, lavatories, and cargo compartments. Each of these fire detection systems requires electrical wire, and failure of this wire could lead to inability of the detection system to function properly. This rule applies to all required fire protection systems with the exception of those for powerplants and APUs. Requirements for EWIS associated those systems are contained in § 25.1731.

Section 25.1733 was originally proposed as § 25.1735. Its number was changed to better harmonize with foreign airworthiness authorities. As stated previously in the discussion under the heading of **Systems and Functions: EWIS (§ 25.1705),** we have revised this rule to include references to §§ 25.854 and 25.858, in response to comments from EASA.

Boeing and GE requested that proposed § 25.1735 (now § 25.1733) be removed from subpart H, because it is not directly related to EWIS certification. The commenters noted that any system, not just fire detection systems, which uses wiring in its design will be required to meet requirements of subpart H.

We have decided to adopt this requirement as proposed. Fire detection systems need wire and other EWIS components to operate. Failure of an associated EWIS component could lead to inability of the detection system to function properly. Therefore EWIS components must

be considered an integral part of the fire detection system and meet requirements of the applicable regulation.

**15. Engine, Nacelle, and APU Wiring**

GE, Honeywell, and AIA/GAMA commented that engine, nacelle, and APU wiring should be exempt from the proposed EWIS certification and maintenance requirements. They said wiring in these areas is extremely rugged, has excellent reliability in service, and is easily accessible for inspection. They further stated that it is physically impossible for a wiring failure or deterioration in the propulsion system to cause a hazardous or catastrophic effect. They expressed the view that existing regulations are adequate, as demonstrated by service experience, and application of these rules to engine, nacelle and APU wiring confers no safety benefit and would result in significant cost to industry.

We agree that EWIS components installed on the engine are very robust. This is because the harsh environment in which they are installed and the critical function engines play in the safe operation of the airplane dictate such robust design and installation. However, we do not agree that it is impossible for an engine wiring failure to cause a hazardous or catastrophic condition. The following quote is from the "Lauda Air B767 Accident Report," dated July 21, 1993, issued by the Aircraft Accident Investigation Committee Ministry of Transport and Communications, Thailand—

> Investigation of the accident disclosed that certain "hot-short" conditions involving the electrical system occurring during an auto-restow command, could potentially cause the DCV to momentarily move to the deploy position.

This illustrates that, in the past, there have been designs where an engine wiring failure could cause a catastrophic accident. Application of these requirements to all wiring on part 25 airplanes will help ensure that in the future we will minimize EWIS designs and installations that could lead to serious safety issues. Our position is consistent with ATSRAC's recommendation that engine wires not be excluded from compliance with these new requirements. Additionally,

our regulatory analysis indicates that these rules are cost effective. We made no rule change due to these comments.

**16. Designated Fire Zones**

General Electric (GE) commented that the entire rulemaking package was written from the perspective of wiring contained in the pressurized fuselage, and then extrapolated to other areas. It stated as an example the assumption made throughout the NPRM that an electrical fire is catastrophic. GE stated that this is not the case in a designated fire zone, because such zones contain specific design measures to safely detect, contain, and put out a fire. The commenter stated that unpressurized portions of the airplane spend much of the flight at ambient pressures which will not easily support combustion. GE suggested that itemizing fuel sources that are isolated from the pressurized portion of the airplane–engine oil, engine fuel–as if they coexisted with the heated and air-conditioned section of the aircraft is very misleading.

We believe that a fire in a fire zone is a safety issue. Fire zones are designated as such because they are areas that have a higher potential for a fire to occur. These zones do have fire detection and suppression systems or other design features to mitigate effects of fire. But these features are designed to meet a limited set of test conditions for a limited duration of time and are not designed to meet all anticipated sets of conditions that may exist in a fire zone. Any fire on board an airplane, no matter where it occurs, has the potential for serious safety consequences.

The rule package was written with the objective of ensuring the safety of wiring in the entire airplane, consistent with the intent of ATSRAC.

**17. Goal of the New Wiring Subpart**

GE and AIA/GAMA commented that many of the proposed subpart H EWIS certification requirements are duplicative of existing part 25 rules. They asserted that repeating a requirement in multiple locations promotes differences in interpretation and confusion over acceptable means of compliance. They recommended that the proposed subpart contain new applicable requirements and act as a collector with references or points to the existing applicable rules. They said this packaging technique would provide the benefit of the common location sought by

the FAA to bring focus to the importance of EWIS design and certification while minimizing the confusion, interpretation, and divergence that challenges use of duplicate rule sets.

We do not agree with the opinion that the proposed certification requirements of subpart H are duplicates of existing part 25 requirements. To be a duplicate implies that the requirement exists in both the new subpart H and in other places within part 25. This is not the case. As described in the proposal's preamble, some of the subpart H requirements previously resided in other part 25 subparts. But they have been relocated to the new subpart H, and in some cases enhanced, and no longer exist elsewhere in part 25. Also, many requirements of subpart H are new requirements. In some cases (for instance in § 25.1705 in this final rule), we reference existing part 25 requirements that are applicable to EWIS but have not been moved into subpart H because they do not lend themselves to division into wire and non-wire portions. The goal of collecting existing part 25 wire-related requirements and developing new requirements is to make them easy to locate, ensure their application to EWIS, and highlight the importance of considering wiring and its associated components as an airplane system. Eliminating the majority of the proposed subpart H requirements and simply referencing other wire-related requirements in a new § 25.1700 series paragraph would not support this goal.

**18. Harmonization**

British Airways, Royal Dutch Airlines (KLM), Airbus, and the Association of Asia Pacific Airlines requested that the proposed FAA and European Aviation Safety Agency's (EASA) EWIS requirements and advisory material be fully harmonized and made identical where possible.

Harmonization of these requirements with EASA has been our goal from the beginning. We have coordinated extensively with EASA and other national civil aviation authorities to achieve this common objective. While there may be some differences in wording because of our differing regulatory procedures, our intent is to harmonize the substantive requirements to the extent possible.

## D. Instructions for Continued Airworthiness: EWIS (§ 25.1729 and Appendix H)

### 1. Requirements for EWIS ICA

Section 25.1729 requires that applicants prepare EWIS ICA in accordance with requirements of Appendix H to part 25. Section 25.1729 was originally proposed as § 25.1739. Its number has been changed to facilitate harmonization with the regulations of foreign airworthiness authorities. Otherwise, this rule remains unchanged from the form in which it was proposed.

This final rule also revises paragraph H25.4 and adds a new paragraph H25.5 to Appendix H – Instructions for Continued Airworthiness. Section H25.5 is a new requirement. It requires TC applicants and applicants for design change to develop maintenance information for EWIS as part of the ICA that are required for design approval. The EWIS ICA must be developed through the use of an enhanced zonal analysis procedure (EZAP). The ICA must include tasks, and intervals for performing those tasks, to reduce the likelihood of ignition sources and accumulation of combustible material and tasks to clean the EWIS of combustible material if there is not an effective task to reduce the likelihood of its accumulation. The ICA must also include –

- Instructions for protections and cautions to prevent accidental damage or contamination to EWIS during maintenance, alteration, or repairs.
- Acceptable maintenance practices in a standard format.
- Wire separation requirements as determined under § 25.1707.
- Information explaining the EWIS identification method and requirements for identifying any changes to EWIS under § 25.1711.
- Electrical load data and instructions for updating that data.

The ICA developed through the use of an EZAP must be in the form of a document appropriate for the information to be provided, easily recognizable as EWIS ICA, and either contain required EWIS ICA or specifically reference other portions of the ICA that contain this information.

The amendment to section H25.4 requires that the Airworthiness Limitations section of the ICA include any mandatory replacement times for EWIS components.

The final wording for the requirement for ICA as a single document was revised from its proposed form, to clarify intent, as discussed below. No other changes have been made to these rules.

**2. ICA as a Single Document**

Boeing and AIA/GAMA requested we delete paragraph H25.5(b) of Appendix H. This paragraph requires that EWIS ICA be contained in a single document, easily recognizable as EWIS ICA. They said their current approach is to produce several documents, including the maintenance planning data document, airplane maintenance manual, and standard wiring practices manual, with appropriate cross-references. These documents may not be EWIS specific. Boeing and AIA/GAMA believe separating EZAP-generated maintenance activities from those required by Special Federal Aviation Regulation (SFAR) 88 defeats the intent of the rule and is impractical.

Additionally, Airbus, and GE suggested we revise H25.5(b) to say "the ICA must be provided in a manner acceptable to the Administrator, where instructions specific to EWIS are easily recognizable." They believe there is no safety benefit in uniquely identifying ICA related to, but not specific to, EWIS. They also requested that proposed § 25.1739 (now § 25.1729) be revised with a reference back to § 25.1529 or deleted in its entirety. They stated that § 25.1529 already requires Instructions for Continued Airworthiness to be developed in accordance with Appendix H.

We do not agree that paragraph H25.5 (b) should be deleted or revised as requested. The requirements of paragraph (b) do not preclude incorporation by reference of detailed information. However, we expect the DAH to provide a document appropriate for the information provided, in other words, a single or source document that either includes the EZAP-generated EWIS ICA or specifies where those EWIS ICA can be located. This also means that, if incorporation by reference is the approach taken by the DAH, all referenced documents are

available at the same time as the EWIS ICA source document. We have revised the text of final H25.5(b) to clarify that the requirement only applies to EWIS ICA developed in accordance with requirements of H25.5(a)(1) and that the "document must either contain the required EWIS ICA or specifically reference other portions of the ICA that contain this information." This does not change the meaning of the requirement, but clarifies it.

We also do not agree with the request to delete or revise § 25.1729. Having a separate requirement for EWIS ICA located within subpart H is consistent with the purpose of creating the new subpart. The goal was to collect existing part 25 wire-related requirements and develop new requirements, make them easy to locate, ensure their application to EWIS, and highlight the importance of considering wiring and its associated component as an airplane system. We made no changes due to this comment.

**3. Standard Wiring Practices Manuals**

Airbus commented about the requirement to include acceptable maintenance practices in a standard format. Airbus made the point that electronic standard wiring practices manuals (SWPM), in which such maintenance practices can be found, are easily searchable. It requested that manufacturers who publish their SWPMs electronically be either exempt from the requirement for a standard format for SWPMs, and/or an interim master breakdown index (which was outlined in the AC as an approach to standardizing SWPM formats without rewriting them), or able to adopt a similar approach.

We are rejecting Airbus's request to exempt electronic versions of the SWPM from requirements of part 25, Appendix H, H25.5. The objective of this requirement is to ensure that maintenance personnel can readily access necessary information. They may work on many different models, so having a standard format will facilitate this. An applicant may propose an alternative "standard" format to that described in the AC, as long as it achieves the same objective (again, taking into account that maintenance personnel will be working on a range of models). The master breakdown index described in AC 25-26 was developed so that existing non-electronic SWPMs would not have to be reformatted. An electronic SWPM, by definition,

can be easily indexed to align with the master breakdown index format as depicted in the AC. We made no changes due to this comment.

**4. Mandatory Replacement Times**

Airbus requested that the requirement in section H25.4 to include mandatory replacement times for EWIS in Airworthiness Limitations of ICA be deleted because it is not related to any requirements to define mandatory EWIS replacement times.

We are retaining H25.4. The intent of this requirement is not to mandate life limits for EWIS components, but to ensure that the designer consider whether EWIS life limitations are applicable to a particular design and identify those limits in the Airworthiness Limitations section of the ICA. Such limitations, if any, would be identified when demonstrating compliance with § 25.1703. That rule requires that EWIS be installed according to limitations specified for that EWIS component, and this might include life limits under certain circumstances. For example, a given EWIS component may be well suited for a particular environment, but because of technological limitations, the material it is made of may degrade over time when exposed to certain environmental stresses. The component manufacturer may recommend that certain tests be performed at given intervals to ensure that its material properties are still within its qualification limits, and if they are not, recommend that the component be replaced. Life limits might also be identified when demonstrating compliance with the EWIS safety assessment requirements of § 25.1705, as part of identifying acceptable mitigation strategies to prevent hazardous or catastrophic failures. We made no changes due to this comment.

**5. Wire Identification Method Information**

Airbus, AIA/GAMA, and GE suggested we delete the requirement in proposed H25.5 for information explaining wire identification methods and requirements for identifying changes to EWIS. They stated that changes to EWIS, including future identification, are the modifier's responsibility, and a DAH cannot anticipate all possible future changes and give instructions for identification methods for changed components.

This requirement is intended to ensure that EWIS components added or changed due to post-TC modifications retain the same identification scheme used by the design approval holder. It is not necessary for the original DAH to anticipate future changes to EWIS. The original DAH is only required to describe the original identification scheme used. An example could be a particular color used to identify EWIS components associated with a fly-by-wire system. It is the responsibility of the future modifier to follow that EWIS identification scheme as required by § 25.1711.

**6. Electrical Load Data**

GE requested confirmation that H25.5(a)(2), (3), (4), and (5) do not apply to the existing fleet. Also, AIA/GAMA and GE contended that electrical load data is a certification issue, not a continued airworthiness issue, and future changes or updates to that information is the modifier's responsibility. They requested that paragraph H25.5(a)(5) be deleted.

The requirements of H25.5(a)(2), (3), (4), and (5) do not apply to the existing fleet unless a modification is introduced that would require that these requirements be part of the type certification basis of the modification, in accordance with 14 CFR 21.101.

We agree that it is the responsibility of modifiers (e.g., STC applicants) to ensure that they update the actual load data of the airplane they are modifying and document the electrical load data as required by H25.5(a)(5). However, we have decided against deleting paragraph H25.5(a)(5). We are using this requirement as a means to ensure that accurate electrical load data is available to those who need it. Accurate electrical load data is necessary to help ensure continued airworthiness. It is important that the load demand of an airplane's systems not exceed the generation and distribution capacity of its electrical power system. By ensuring this, the necessary levels of electrical power will always be available for those airplane systems needed for safe operation. We made no changes due to this comment.

## E. Continued Airworthiness and Safety Improvements Subparts for Operating Rules (Parts 91, 121, 125, 129)

### 1. Establishment of New Subparts

This rule establishes new subparts in parts 91, 121, 125, and 129. These new subparts will contain operator requirements for continued airworthiness and safety improvements, just as the new part 26 will contain requirements for continued airworthiness and safety improvements applicable to DAHs. As we stated in the NPRM:

> The FAA believes that inclusion of certain rules under the new subparts will improve the reader's ability to readily identify rules pertinent to continued airworthiness. . . . The proposed new subparts consist of relocated, revised, and new regulations pertaining to continued airworthiness of the airplane. Unless we say otherwise, our purpose in moving requirements to these new subparts is to ensure easy visibility of those requirements applicable to the continued airworthiness of the airplane. We do not intend to change their legal effect in any other way. (70 FR 58537)

Our creating these new subparts does not, by itself, impose any new requirements; it simply establishes the locations in which these requirements will be placed. In some cases, as with the fuel tank safety provisions of today's final rule, we may adopt parallel sections in all four new subparts. In other cases, as with the EWIS provisions of today's final rule, we may adopt requirements in only certain subparts. But in each case, the new requirements will only be adopted after public notice and opportunity to comment where we will explain the proposed scope and effect of the new requirements.

Other new regulations and new subparts have been added to the CFR since publication of the NPRM. As a result, some of the rule numbers and some of the letter names for the new subparts that were proposed for this rule have already been used. In this final rule we have revised those rule numbers and subpart letter names where necessary.

Provisions enabling each of the new Continued Airworthiness and Safety Improvements subparts, which were inadvertently left out of the proposal, have been added here. The

placement of certain provisions within the rules has also been revised. The table below indicates the changes. Commenters' original references are retained here, however, for ease of reference to the proposal, including references to draft ACs.

**Table 3**

**Operations Rules Changes from NPRM to Final Rule**

| Part | Final Rule | NPRM |
|---|---|---|
| 91 | § 91.1(d) (new) | N/A |
| 91 | Subpart L—Continued Airworthiness and Safety Improvements | Subpart L—Continued Airworthiness and Safety Improvements |
| 91 | § 91.1501 Purpose and definition | §§ 91.1501 Purpose and definition |
| 91 | § 91.1507 Fuel tank system inspection program | § 91.1507 Fuel tank system maintenance program |
| 121 | § 121.1(g) (new) | N/A |
| 121 | Subpart AA—Continued Airworthiness and Safety Improvements | Subpart Y—Continued Airworthiness and Safety Improvements |
| 121 | § 121.1101 Purpose and definition. | § 121.901 Purpose and definition. |
| 121 | § 121.1111 Electrical wiring interconnection systems (EWIS) maintenance program. | § 121.911 Electrical wiring interconnection systems (EWIS) maintenance program. |
| 121 | § 121.1113 Fuel tank system maintenance program. | § 121.913 Fuel tank system maintenance program. |
| 125 | § 125.1(e) (new) | N/A |
| 125 | Subpart M—Continued Airworthiness and Safety Improvements | Subpart M—Continued Airworthiness and Safety Improvements |
| 125 | § 125.501 Purpose and definition. | § 125.501 Purpose and definition. |
| 125 | § 125.507 Fuel tank system inspection program. | § 125.507 Fuel tank system inspection program. |
| 129 | Subpart A—General | Subpart A—General |
| 129 | § 129.1(b) | § 129.1(b) |

| Part | Final Rule | NPRM |
|---|---|---|
| 129 | Subpart B—Continued Airworthiness and Safety Improvements | Subpart B—Continued Airworthiness and Safety Improvements |
| 129 | § 129.101 Purpose and definition. | § 129.101 Purpose and definition. |
| 129 | § 129. 111 Electrical wiring interconnection systems (EWIS) maintenance program. | § 129.111 Electrical wiring interconnection systems (EWIS) maintenance program. |
| 129 | § 129.113 Fuel tank system maintenance program. | § 129.113 Fuel tank system maintenance program. |

**2. Continued Airworthiness Subparts and Airworthiness Directives**

The Regional Airline Association (RAA) commented that proposed § 121.901(a) (now § 121.1101(a)), as a stand-alone provision, is unlimited in scope. It contended that the requirement can be interpreted to mean that operators must incorporate any future design and maintenance changes that a type certificate holder incorporates into its ICA, regardless of their airworthiness status. The RAA said that this would effectively eliminate the need for any future airworthiness directives. The RAA said it therefore has the potential to eliminate operator participation in the rulemaking process for future original equipment manufacturers' recommendations affecting maintenance and design of their fleet.

In a similar vein, United Parcel Service (UPS) recommended we not adopt the new subpart for part 121 and instead use the part 39 AD process to implement required actions once the necessary data and documents have been developed by manufacturers. It stated the new subpart, as proposed, will allow the FAA to impose regulations prior to development of a technically feasible solution available for comment. UPS stated that operators would be unable to accurately comment on the cost and feasibility of the actions required for compliance. The current AD process allows operators the ability to comment on a specific solution with a known cost impact.

We do not believe that §121.1101(a) as a stand-alone provision can be reasonably construed as unlimited in scope. Section 121.1101(a) describes the purpose of the new Subpart

AA and who it is applicable to, and defines the "FAA Oversight Office." It does not impose technical requirements. Any specific requirements for continued airworthiness and safety improvements will be proposed for comment in the same way as the EWIS and fuel tank safety requirements included in this final rule were proposed for comment. The FAA will continue to issue airworthiness directives in accordance with requirements of 14 CFR part 39 when we find that an unsafe condition exists in a product and the condition is likely to exist or develop in other products of the same type design.

We also disagree that subpart AA should not be created. The new requirements contained in subpart AA are necessary to raise the level of safety by correcting fleet-wide continued airworthiness issues. Airworthiness directives only address specific unsafe conditions that exist in a product and are likely to exist or develop on products of the same type design. Continued airworthiness issues, such as EWIS maintenance, affect all transport category airplanes. In addition, using ADs to implement these requirements would mean that ADs would need to be continually issued as new models, model variants, or modifications are introduced by a DAH. The use of the AD process to impose the requirements contained in subpart AA would not be the most effective method to address these issues.

We do not believe that adopting the new subpart instead of issuing ADs will prevent operators from being able to accurately comment on the cost and feasibility of the manufacturers' proposed requirements. It would be impractical to set up a comment period for each specific set of maintenance changes developed by the manufacturers, as the commenter appears to want. However, a substantial cost/benefit analysis is always prepared to support any proposed 14 CFR regulation and public comments are solicited. This is a more comprehensive analysis than those prepared for an AD. We made no changes due to this comment.

**3. Type and Scope of Requirements**

The Air Transport Association (ATA) commented that in proposed §121.1101(a), the words"… may include, but are not limited to …" can be interpreted to mean that at a <u>minimum</u> the operator's maintenance program <u>must</u> incorporate 100% of all design changes and 100% of all

ICA, not just the EWIS/FTS design changes and ICAs to be developed. ATA stated there is no justification presented in the NPRM for such an open-ended regulatory requirement. It said this requirement cannot be interpreted consistently by all operators impacted or by all the FAA Aviation Safety Inspectors with oversight responsibility. ATA recommended that the second sentence of §121.1101(a) be rewritten as follows:

> These requirements may include revising the maintenance program by incorporating the intent of applicable revisions to the Instructions for Continued Airworthiness, as identified in this subpart.

As explained in the NPRM (at 58538-9), this rulemaking is one of several to adopt new requirements relating to continued airworthiness, and the purpose of creating these new subparts is to have a common location for all of these requirements, both existing and proposed. The purpose of §121.1101(a) (and its counterparts, § § 91.1501(a), 125.501(a), and 129.101(a) ), is to identify the type and scope of requirements that may be included within this subpart. It is purposely broad to encompass possible future rulemaking but does not itself impose requirements. Any future requirements will be proposed through the normal rulemaking process and all interested parties will be afforded the opportunity to comment on them.

As under current requirements for ICA, a TC holder is required to update ICA to address any new design change for which they get approval. An operator altering an airplane to incorporate the new design change would have to update its maintenance program "based on" the approved ICA. TC holders may also update their ICA in the absence of design changes, but, as under existing regulations, these updates would not be mandatory unless we issue an AD mandating them, which we would do only if necessary to address an unsafe condition. Operators may also independently revise their EWIS and fuel tank ICA. Under today's final rule, these changes would have to be approved by their Principal Inspector.

## F. Operating Requirements for EWIS (Parts 121 and 129)

### 1. Requirements for Maintenance and Inspection Program Revisions

For those operating under parts 121 and 129, we are establishing, within the new Continued Airworthiness and Safety Improvements subparts, requirements to revise maintenance and inspection programs to include maintenance and inspection tasks for EWIS. The tasks must be based on ICA developed in accordance with Appendix H.

We have extended the compliance dates for §§ 121.1111 and 129.111. They were originally proposed with a compliance date of December 16, 2008. But as a result of comments discussed earlier we have decided to fix the time for compliance as a number of months after the effective date, rather than as a hard date, and to also allow some additional time beyond that which was originally contemplated. The compliance date for these rules is now 39 months after the effective date of the rule. We have also revised these rules to clarify meaning, as discussed below.

### 2. ICA Developed by Design Approval Holders

Boeing noted that the proposed operational regulations would require that the maintenance program revisions be <u>based on</u> ICA developed by the DAH. Boeing would like clarification of the interpretation of the term "based on." It asked whether certificate holders are expected to adopt, without change, the ICA provided by the DAHs.

As discussed previously, it was not our intent to require operators to use ICA developed by TC holders. While we think it is very likely that operators will use those ICA, we intend that they be able either to develop their own or to contract with third parties for ICA, as long as they meet the applicable requirements. We have revised the operational rules to clarify this flexibility. Deviations from the EWIS or fuel tank system maintenance programs that have been developed in accordance with the requirements of SFAR 88 or Appendix H must be approved by the operator's Principal Inspector, who will coordinate the changes with the FAA Oversight Office as appropriate. Similarly, later changes to either the EWIS maintenance program or the fuel tank system maintenance program must be approved by the operator's Principal Inspector,

who will coordinate the changes with the FAA Oversight Office, as appropriate. In some cases, coordination with the Oversight Office will be necessary to ensure that the program's original objectives are still met. Details of these coordination procedures are defined in an FAA order and described in an advisory circular.

**3. Different Requirements for Existing and Future Designs**

RAA requested that proposed § 121.911 (now § 121.1111) be revised so the performance objective of the "retrofit" requirements may be distinguished from the design changes that may be considered for newly manufactured fleet types. The commenter assumed that each OEM will be required to re-certify to the new standards provided in the part 25 proposal, and that carriers would be subjected to a massive retrofit program. NACA requested that we clarify requirements by being more specific about differences between new production aircraft and retrofitting aircraft. They ask if all the part 25 enhancements will become ICA and fall under these requirements.

At the outset, § 121.1111 requires neither "retrofit" nor "design changes." It simply imposes requirements for operators' maintenance programs. We agree that some clarification is appropriate. As explained in the NPRM, the purpose of § 26.11 is to require type certificate holders to develop ICA for existing airplanes that would enable operators to comply with this section. For those airplanes, only certain provisions of new paragraph H25.5 (H25.5(a)(1) and (b)) are required. But for all future airplane designs subject to new § 25.1729, type certificate applicants must show compliance with all provisions of paragraphs H25.4(a)(3) and H25.5. Our intent in the operational rules is to require operators to incorporate into their maintenance programs all of the EWIS ICA developed for each of their airplanes. For existing airplanes, this would be limited to ICA meeting paragraphs H25.5(a)(1) and (b). For future airplanes, this would also include ICA meeting the remaining requirements of paragraphs H25.4(a)(3) and H25.5. We have revised § 121.1111 (and § 129.111) to clarify these differences.

KLM disagreed with the requirement for operators of all airplanes, regardless of the airplane's age, to implement maintenance program inspections and procedures for EWIS. The

commenter contended that the amount of exposure to deteriorating factors on new aircraft is limited, so there is negligible benefit to performing additional maintenance tasks on wiring. The commenter also pointed out that checking wiring on a new aircraft may even cause more wiring failures due to maintenance near the wiring. KLM suggested we consider a threshold for starting the first inspections

Although older airplanes have been exposed to more stressors that can accelerate the degradation of wire and other EWIS components, age is not the sole factor in degradation. We do not want to specify a threshold for starting the first EWIS inspections. The intervals for performing the inspections, including the first ones, are determined by performing the EZAP analysis. Factors to be considered in establishing intervals are the hostility of the environment in which the EWIS is located and the likelihood of accidental damage. Neither of these factors is necessarily dependent on age, and EWIS failures can occur on newer airplanes. So the "threshold" for the first EWIS inspection would normally be the same as the interval, measured from the issuance of the first certificate of airworthiness. The results of the analysis are reviewed by industry working groups (as part of the MSG-3 process) and approved by the FAA Oversight Office. It is during the industry working group review that the final inspection intervals are set and subsequently approved by the FAA. We made no changes due to this comment.

**4. ICA for Alterations**

British Airways requested that proposed § 121.911 (now § 121.1111) be revised to state that if changes to the ICA are required after alterations, incorporation of these changes into the maintenance program may be delayed until after the airplane has resumed service, but before it reaches the " relevant age or flight hours." The commenter expressed concern that the current wording would result in extended operational delays and grounded aircraft after minor alterations or repairs. British Airways also expressed concerns about SFAR 88-related alterations/component changes conducted while the airplane is in a normal operating environment (e.g., at the ramp). It asked whether inspections or incorporation of ICA changes to

the maintenance program must be completed before resuming operations and, if so, requests a rule change allowing ICA incorporation into maintenance programs after the airplane returns to service but before it reaches the "relevant age or flight hours."

The only alterations for which EWIS ICA will be developed are those for which compliance with either §§ 26.11 or 25.1729 must be shown—in other words, major alterations approved under STCs or amended TCs. The only alterations for which fuel tank system ICA will be developed are those for which compliance with either SFAR 88 or § 25.1529 must be shown—again, major alterations approved under STCs or amended TCs. We believe that any of these alterations would be scheduled to occur during a period of allocated downtime such as a scheduled maintenance "C Check." The maintenance planning for such modifications should include the actions necessary to incorporate additional EWIS or fuel tank ICA into the approved maintenance or inspection program. No additional time would be needed for these actions. Accordingly, no changes were made due to these comments.

**5. Alaska Operations**

Senator Stevens of Alaska stated that this rule will have severe consequences to residents and cargo carriers operating in his state. Referencing Section 1205 of the Federal Aviation Reauthorization Act of 1996 (49 U.S.C. § 40113(f)), and the uniqueness of aviation in Alaska, Senator Stevens, Everts Air Cargo, and Alaska Senator Murkowski requested that "intrastate" operations in Alaska be exempted from this rule.

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. We have determined that there would not be an adverse effect and that regulatory distinctions are inappropriate.

Under both EAPAS and the Fuel Tank Safety Rule, manufacturers are required to develop maintenance program revisions and make them available to operators to support their compliance with the operational rules. We have concluded that in the case of both the EAPAS and FTS operations rules, any burden on affected operators in implementing these changes

would not have a significant impact. Under EAPAS, the changes would be integrated into existing inspections that are currently performed during heavy maintenance checks. The fuel tank tasks, which would be aligned with the EAPAS inspections, would also be performed during these checks. Because these additional inspections would be only a small additional piece of a much more extensive maintenance visit, we concluded that they would have no adverse effect on intrastate service in Alaska.

Lynden Air Cargo requested that the L-382G aircraft be excluded from requirements of proposed §§ 121.911 and 121.913 (now §§ 121.1111 and 121.1113). Senator Stevens asked that Lynden Air Cargo's six L-382G airplanes in interstate operation be exempted. Lynden Air Cargo said that it does not carry passengers and operates a small fleet largely outside the U.S. It stated that it is in the public interest to maintain its unique capabilities in Alaska where it supports remote communities and projects with no roads or waterways, as well as regularly supporting the U.S. military during critical campaigns and the ongoing war on terrorism. Lynden Air Cargo also asked to be excluded from § 121.909 (now § 121.1109).

We do not believe it is appropriate to exclude the L-382G from requirements of § 121.1111 and 121.1113 for those airplanes in interstate operation. The safety rationale for these rules applies equally to that airplane. Lynden Air Cargo may apply for an exemption to these rules in accordance with 14 CFR part 11. However, under § 11.81, Lynden Air Cargo must provide information stating why granting such an exemption would be in the public interest and why it would not adversely affect safety, or how it would provide a level of safety equivalent to the final rule. Also, we are not granting Lynden Air Cargo's request for an exclusion from § 121.1109. That requirement, which is not a new rule but simply a renumbering of the requirement formerly designated as § 121.370a, has been in effect since November 1, 2002 (reference 67 FR 72761, December 6, 2002), and we did not make any changes to that rule other than changing its section number.

**6. EWIS Inspections**

Lynden Air Cargo stated that it does not have the engineering staff to effectively analyze and

comment on the myriad complexities associated with the proposed certification rule changes. However, it said that with an aircraft type certificated under CAR 4b (Lockheed L-382G Hercules), the cost to "retroactively" apply these new certification rules would require extraordinary expenditures. Lynden had the following concerns about the practical application and implementation of specific inspection criteria for EWIS under EZAP-developed methods:

- How does an inspector accomplishing a general visual inspection (GVI) or a detailed inspection (DET) of EWIS make a specific determination of airworthiness? The FAA has failed to state an objective criteria in its proposed rule (i.e., what will be the accept/reject criteria?).
- If there are no actual circuit defects, what corrective action will be required? An immediate action? Or can it be scheduled and effectively planned for a future inspection action?
- Disturbing wire bundles for inspections can induce more problems than are corrected.

The proposed operating rules do not require "retroactive" application of design requirements. They do require that operators include EWIS maintenance tasks in their maintenance programs. Any post-inspection actions are based on results of the GVI or DET. If inspections determine that EWIS components need cleaning or repairing, procedures for accomplishing these tasks are contained in the airplane manufacturer's standard wiring practices manual or equivalent procedures developed by the operator. If inspection shows that no circuit defects exist (to use the words of the commenter) then no corrective action would be required. We agree that moving, or disturbing, wire bundles does have the potential to cause damage if not done with care. Precautions for preventing such damage should be part of the operator's overall EWIS maintenance program.

**7. Non-U.S. Registered Airplanes**

Boeing requested that the FAA clarify whether the proposed part 129 rule would affect foreign operators operating non-U.S. registered airplanes into the United States. They noted that

part 129 usually applies to these operations and it seems unusual that they have been omitted in the proposed rule.

Under International Civil Aviation Organization (ICAO) Annex[7] 8, the state of registry of an airplane is the state responsible for its airworthiness. For this reason, the airworthiness regulations of part 129, including those contained in new subpart B, apply only to U.S.-registered airplanes.

**8. Taking Airplanes Out of Service**

US Airways requested clarification of § 91.911 to stipulate that aircraft need not be taken out of service specifically to accomplish the revised inspections.

We believe that US Airways meant to ask for clarification of § 121.911 (now § 121.1111) instead of § 91.911, which is not contained in the proposal. Operators will have considerable flexibility in determining when inspections will be performed. For example, in the appendix of the DAH EZAP AC, which describes an acceptable procedure for establishing EWIS inspection intervals, even inspections of EWIS located in the most severe environment with the highest risk of accidental damage may be performed at intervals ranging from an "A" check to a "1-C" check, which are normally scheduled maintenance intervals. Although we cannot guarantee that an airplane will not have to be taken out of service specifically to accomplish the new EWIS maintenance program requirements, we believe these tasks can be scheduled to be performed during other scheduled maintenance times. Section 121.1111 does not require tasks to be accomplished at any particular intervals. It only requires that the maintenance program for a particular airplane include inspections and procedures for EWIS.

**9. Training**

The NTSB referred to its recommendation A-00-108 of Sept. 19, 2000, in which it asked the FAA to address the need for improved training of maintenance personnel to ensure adequate recognition and repair of potentially unsafe wiring conditions. The NTSB commented that, since

[7] ICAO's 98 articles, created and accepted at its Chicago Convention, established the privileges and obligations of member states. Standards and recommended practices of ICAO are designated as "Annexes" to the Convention.

non-EWIS maintenance actions often compromise EWIS safety, training of all maintenance personnel on EWIS maintenance and inspection is critical. The board would like us to amend the NPRM to specifically state that all maintenance personnel must receive EWIS training.

We agree with the NTSB on the importance of training personnel not directly involved with EWIS maintenance and inspection. But the cost of training all groups identified by ATSRAC as people working directly with, indirectly with, or in the vicinity of, EWIS was not commensurate with the benefits. While not required as a result of this final rule, AC 120-94 provides a sample curriculum for a more comprehensive training program. We strongly encourage organizations to voluntarily offer this training.

**10. Reporting Requirements**

The NTSB commented that in its recommendation A-00-108 it asked the FAA to address improved reporting of potentially unsafe electrical wiring conditions. It noted that the NPRM holds manufacturers and operators responsible for proper maintenance and inspection of EWIS. The board contends there can be no quantitative measurement of how well the maintenance and inspection system is performing without an effective mechanism to collect basic data, examine the findings, and provide reporting about performance.

The NTSB noted that, even though it has supported the FAA's previous NPRMs to revise and improve the service difficulty reporting (SDR) system, the FAA has withdrawn both. It noted that restricted access to existing data and inability to effectively search available data inhibits research into recurring or potential problems that may exist across operators, and such research is important in the prevention of accidents. The board strongly encouraged the FAA to amend the NPRM to address this issue and revise the SDR system, regardless of any potential industry opposition.

We have developed an Enhanced Airworthiness Datamart (EADM), covering the years 1995 to the present, which provides analysts with a more detailed view of SDRs. We have deployed the EADM on the Aviation Safety Information Analysis and Sharing (ASIAS) system secured portal. It integrates those reports with information on aircraft age, hours, and cycles

from the Airclaims database. The resulting data set allows the user to identify trends in service difficulties as a fleet of aircraft ages.

Also, with the 1995 creation of the Air Transport Association (ATA) code 97 for electrical wiring, precise reporting of electrical problems is possible. In 1995 the FAA updated its Joint Aircraft Systems/Component Codes (JASC) to include electrical wiring. We added ATA code 97 to each airplane system category for the wiring within those systems. Because of these new analysis tools, we made no changes due to this comment. While the value of the contents of service difficulty reporting systems is contingent upon the accuracy of reporting by the operators, the data is publicly available and useful in analysis (http://av-info.faa.gov/isdr/SDRQueryControl.ASP?vB=IE&cD=32).

**G. Operating Requirements for Fuel Tank Systems (Parts 91, 121, 125, and 129)**

**1. Requirements for Maintenance and Inspection Program Revisions**

This rule includes provisions for operators to revise their maintenance programs by adding maintenance tasks for fuel tanks. These maintenance tasks must be based on ICA that have been developed in accordance with SFAR 88 or § 25.1529 and Appendix H and approved by the FAA Oversight Office. Parts 91, 121, 125, and 129 each contain these requirements in the new subparts for Continued Airworthiness and Safety Improvements. These fuel tank requirements are not new requirements. Rather, they clarify requirements of previously existing rules.

When this rule was proposed in October 2005, our intent was to set the same operator compliance date for the fuel tank and EWIS maintenance program revisions. This would have allowed both sets of tasks to be added at the same time and required that the maintenance program be revised only once. As discussed earlier, the rulemaking process took longer than expected. At this time, we do not want to delay inclusion of the fuel tank tasks into maintenance. Thus, while the compliance date for the EWIS maintenance revision requirements of §§ 121.1111 and 129.111 has been changed, the compliance date for this fuel tank maintenance revision requirement remains December 16, 2008, the date that was originally proposed. We

have, however, changed the date by which the certificate holder must submit maintenance instructions for auxiliary fuel tanks to the FAA Oversight Office. That date is now June 16, 2008. The list of airplanes excluded from the requirements of these rules has also been changed. The requirement in § 26.11 that the EWIS ICA prepared by the DAH must be compared with fuel tank ICA to ensure compatibility and minimize redundancy remains unchanged.

**2. Airplanes Excluded from Fuel Tank System Operating Requirements**

We have revised the list of airplanes excluded from the operating requirements for fuel tank systems. For these rules, which affect airplanes operating under parts 91, 121, 125, and 129, the list of excluded airplanes includes those models of airplanes that are neither U.S.-registered nor operated under these parts. Because of this, the type certificate holders have not complied with SFAR 88 and, in several cases, the type certificates have been surrendered. Subjecting these models to the operational requirements for fuel tank safety would, therefore, have no effect.

Additionally, since the Vickers Viscount airplane was originally type certificated before January 1, 1958, this airplane is not subject to the EAPAS or Fuel Tank Safety rules because of the general exclusion of airplanes type certificated before that date. This airplane model has been removed from the exclusion list originally proposed. Similarly, the Convair and DC-3 models that have been modified to incorporate turbine-powered engines are also covered by this general exclusion. The Lockheed L-300 has been added to the exclusion list. That exception was granted because there is only one qualified aircraft, which was modified, used, and later retired by NASA in 1995. It would not be cost effective to bring it into 121 operations.

The proposal excluded the Lockheed L-188, the Mitsubishi YS-11, and the BAC 1-11. There are still more than 20 airplanes of each model listed on the U.S. registry. For these models, the FAA has granted partial exemptions to the respective DAHs for SFAR 88 requirements. In each case, these exemptions, while relieving design approval holders of some requirements, also have required them to develop service information to be provided to affected operators and have explicitly declined to exempt the operators from these operational rules.

Therefore, we have reconsidered the proposed exclusion of these models and concluded that they should not be excluded.

The following airplane models are excluded from the Fuel Tank Safety Operational Rules.

(1) Bombardier CL-44

(2) Concorde

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

(4) VFW-Vereinigte Flugtechnische Werk VFW-614

(5) Illyushin Aviation IL 96T

(6) Bristol Aircraft Britannia 305

(7) Handley Page Herald Type 300

(8) Avions Marcel Dassault - Breguet Aviation Mercure 100C

(9) Airbus Caravelle

(10) Lockheed L-300

**3. Change in Operator Compliance Date for Auxiliary Fuel Tank ICA**

As stated in the NPRM preamble, the current FTS requirements mandate that ICA must be developed for the ‘‘actual configuration of the fuel tank systems of each affected airplane.’’ The fuel tank ICA must address the fuel tank system as defined by the airplane’s type certificate (TC), any supplemental TCs, and any field-approved incorporated auxiliary fuel tank systems.

In the NPRM preamble, we acknowledged that the original wording of the Fuel Tank Safety Rule proved to be unclear to many in the industry. We proposed revised regulatory language in the NPRM to clarify the original intent. The revision clarifies that holders of STCs, as well as TC holders for the affected airplane models, must develop ICA as required by SFAR 88, and that the operator is required to develop maintenance instructions for field-approved auxiliary fuel tanks. The clarified language regarding field-approved auxiliary fuel tanks was included in paragraphs 91.1507(b), 121.913(b) (the number of proposed § 121.913 has been changed in this final rule to § 121.1113), 125.507(b), and 129.113(b) of the NPRM. Those

paragraphs require operators to develop and submit to the FAA Oversight Office proposed ICA by December 16, 2007 to address their field-approved auxiliary fuel tanks.

While the referenced paragraphs were clarifications and not newly proposed requirements, industry has expressed uncertainty regarding the scope of effort required by operators. As that uncertainty will not be completely addressed until issuance of this rule, which will provide the necessary clarification, we think it is appropriate to provide additional time for operators to develop and submit auxiliary fuel tank ICA proposals to the FAA Oversight Office. We have decided to extend the compliance date for these operator submittals to June 16, 2008. This will allow additional time for operators to conduct the necessary analyses and develop appropriate ICA, or contract with other experts to perform this work if needed. The June 16, 2008 date will also allow adequate time for the FAA's Oversight Office to review and approve the operator-developed ICA and for the operators to revise their maintenance programs accordingly by December 16, 2008.

**4. Original Configuration and Auxiliary Fuel Tanks**

United Airlines referred to the statement in the NPRM that new maintenance programs must be developed based on the actual configuration of the aircraft. It asked if this is intended to include only major alterations (STCs), or minor alterations affecting wiring systems as well.

The commenter refers to a portion of the NPRM discussing operational requirements of the Fuel Tank Safety Rule. As explained in the NPRM, we are revising these requirements to eliminate reference to the "actual configuration" of the fuel tank system. Instead, these requirements clarify that operators' maintenance programs must address the fuel tank system of the airplane as originally configured and auxiliary fuel tanks later installed. All auxiliary fuel tank installations are considered major alterations.

On a related issue, under the operational rules adopted as part of the Fuel Tank Safety Rule (§ 121.370(b)), operators were required to revise their maintenance programs to include fuel tank safety instructions, regardless of whether TC and STC holders provided such revisions, as required by SFAR 88. In this final rule, we revise these operational requirements to require

that operators revise their maintenance programs to incorporate fuel tank ICA developed by TC holders, ICA developed by the operator for field approved auxiliary fuel tanks, and ICA developed by STC holders, if any. The effect of this change is that, except for auxiliary fuel tanks installed under field approvals, operators are not required to develop ICA to comply with this rule; they are only required to revise their programs to incorporate ICA developed by others. Therefore if an STC holder does not develop ICA, then the operator has no further action to comply with the operational rule for that STC design configuration. However, if it appears STC holders will not provide timely support for the operators, we will consider enforcement action.

**5. Inspection and Maintenance Program Terminology**

Boeing commented that § 125.507 refers to a fuel tank system inspection program; whereas the companion sections in parts 91, 121, and 129 refer to a fuel tank system maintenance program. It asked whether this difference was intentional, and, if so, what is the purpose of the difference.

Boeing identifies a long-standing difference in terminology between the regulations applicable to air carrier operations (parts 121 and 129) and other operations (parts 91 and 125). For air carriers, we commonly use the term "maintenance program" to refer to the required program for inspection and maintenance of aircraft (see §§ 121.367 and 129.14). For other operations, we use the term "inspection program," which is typically narrower in scope than the programs required of air carriers (see §§ 91.409 and 125.247). For purposes of this rulemaking, the requirements for the two types of programs are the same. As Boeing notes, we have not always been consistent in our use of this terminology.

**H. Regulatory Evaluation**

The final regulatory evaluation that accompanies this final rule can be found in the docket. In response to comments, we have revised our cost and benefit estimates in several instances from those included in the initial regulatory evaluation.

**1. Engine Costs**

GE commented that new rules invariably involve additional engineering work on the first certification program to comply. There is often redesign required partway through the program, especially when airplane rules are being applied to engine components, which are designed in advance of the airplane. GE estimated additional costs of understanding proposed subpart H and redesigning engine wiring accordingly at $3,000,000 to $7,000,000 for the first certification program only, and this figure doesn't include additional costs identified by regulation.

We accept this estimate and incorporate this general engineering cost into the costs estimated in our final regulatory evaluation. To estimate total general engine design costs to the industry, we use a median of $5 million and multiply it by the number of engine manufacturers (5) to arrive at total costs of $25 million ($23.4 million present value using a discount rate of 7%).

**2. Wiring System Safety Analysis for Engines**

GE commented that the proposed § 25.1705 (now § 25.1709) requirement for an independent safety analysis of wiring systems would add to the certification cost of each new program. The incremental cost would be similar to the existing cost of a safety analysis.

Since the original comment, the engine manufacturer has provided additional supporting data. The FAA agrees and incorporates this data into this regulatory evaluation. The total estimated cost to this engine manufacturer as a result of this requirement is $6.6 million ($3.2 million present value).

We have revised our cost evaluation based upon this estimate. Using this annual estimate for one manufacturer, we have developed an industry estimate. The corresponding total cost for five engine manufacturers is $31.5 million ($14.7 million present value) and is contained in the final regulatory evaluation.

**3. Labor Rates**

GE commented that the estimated fully burdened hourly labor cost of $55.18 for engineers is too low because it doesn't include employee benefits. GE contended that including

benefits would bring labor costs to $73 per hour. Boeing commented that in this proposal and the proposed rule on "Reduction of Fuel Tank Flammability in Transport Category Airplanes" there were differences in the fully burdened rates used for aviation engineers and mechanics. Boeing requested that costs associated with this proposal be reevaluated using the more realistic rates contained in Docket No. FAA-2005-22997.

We have updated the wage rates in our final regulatory analysis. In the final regulatory evaluation we use $75 as the burdened hourly cost for an engineer and $50 as the burdened hourly cost for a mechanic. A detailed discussion can be found in the "key assumptions & labor rates" section of the final regulatory evaluation.

**4. The Regional Airplane Fleet**

The Regional Airline Association (RAA) requested we revise the cost-benefit analysis because it cites no regional transport category airplane accidents or incidents to indicate that concern over wiring systems is comparable for all airplanes affected by the proposed rule. The commenter said that wiring system malfunctions are generally unique to a specific fleet type, and the review of the NTSB database, most of the EAPAS NPRM Supplemental Material, and ATSRAC's review were limited to wiring discrepancies in airplanes with passenger seating of 100 persons or more. The RAA stated that differences in the regional airline fleet would justify a less stringent design review. For example, no airplanes with 50 seats or less have in-flight entertainment systems. Regional airplane galleys generally have no more than a single coffee maker, and almost none have ovens, so the electrical loads and wiring required to support this type of service is minimal. Regional operators are less likely to revise seating or make other modifications to the cabin from their original configuration. The commenter said that inspection of regional airplanes affords fewer opportunities to disturb existing wiring, since accessibility into locations where wire bundles may be inadvertently damaged is limited. It noted that the turboprop fleet, in particular, operates at altitudes and locations where emergency landings can be readily accomplished.

The RAA said its members will incur greater costs than the larger fleet because regional operators must amortize compliance costs over a significantly smaller seat revenue base.

Smaller transport airplanes do, and will continue to, exhibit the same EWIS degradation issues found in larger transports in absence of this final rule. Since the NPRM, the NTSB has issued Safety Recommendations A-06-29 through -35 pertaining to fires on one particular model of regional jet. In the six months between October 2005 and March 2006, there were a total of six fires on regional jets. A seventh fire occurred prior to that six month period. In addition to the danger posed by the resulting fires, the NTSB stated that two of the incident airplanes temporarily lost all flight displays. The investigation by the NTSB revealed that all of the fires originated from the same electrical component[8] and that the fires were caused by moisture-induced short circuits between the electrical terminals of the contactors. If the requirements contained in this final rule had been in effect, the type of failure that was the cause of these seven fires would not have occurred. This is because several of the new requirements directly address the design issues that lead to the fires. The following bullets address the specific requirements and the reason the failures would have been prevented.

- § 25.1701 provides a regulatory definition of an EWIS. The portion of the electrical contactor that was the cause of the failure would have been considered an EWIS component.

- § 25.1703 requires the proper selection of EWIS components. Although the electrical contactor was qualified to perform its intended function by the current § 25.1301, the new requirements of § 25.1703 would have gone further by requiring a specific assessment of the component to ensure that it is installed correctly and operated

[8] An electrical contactor located in the avionics compartment beneath the floor and slightly aft of the captain's seat

within its limitations (§ 25.1703(a)(2)) and that if located in a known area of moisture accumulation (which it is) that it be protected to minimize any hazardous effects due to moisture (§ 25.1703(d)).

- §§ 25.1707 and 25.1709 would have prevented redundant power sources for essential airplane systems from receiving power from the same electrical contactor, as was the case with this aircraft design. Section 25.1707 requires that adequate separation between power sources be provided and that they not interfere with each other. Section 25.1709 requires an EWIS safety assessment to demonstrate that failures cannot occur unless they can be shown to be either extremely remote or extremely improbable, depending on the severity of the failure.

The regional jet (RJ) fleet uses the same EWIS components, design and installation methods, and maintenance techniques as the larger transports. Although RJs typically do not have in-flight entertainment systems and the same type of galleys as the larger transports, they share many systems that have historically exhibited EWIS-related problems. Examples are the power distribution systems, cargo areas, hydraulic systems, wheel wells, and high density areas such as the cockpit and avionics racks. On average, RJs fly more cycles per day than larger transports. So while their life cycle might be shorter in years than the larger transports, because their systems are cycled on a more frequent basis, their EWIS are subjected to more exacerbating factors causing degradation in a shorter period of time. We have reviewed SDR data spanning a five year period to specifically identify EWIS failures on RJs. Although the NTSB findings alone might demonstrate the underlying necessity of this final rule, in response to comment, the FAA has evaluated the annual number of wiring SDRs specifically by aircraft category. The final regulatory evaluation demonstrates that the number of EWIS failures for regional jets and large transports should not be examined separately.

**5. Measure of Effectiveness**

The RAA requested that we validate use of a 68% effectiveness measure in the cost-benefit analysis. It noted that the benefit analysis suggests that by adopting the proposed regulations, "industry will be able to detect 68 percent of EWIS problems before a failure occurs." This was based on an FAA review of service difficulty reports (SDR) for EWIS failures for the period 1995-2002 and expert judgment. The commenter said that it could not determine the validity of the SDR analysis, but that NTSB data over the last 10 years does not show the wiring malfunctions projected by this benefit analysis. The RAA contended that the SDR review and expert judgment of SDR data does not reflect the types of malfunctions that would cause unscheduled landings or non-fatal and fatal events, and that the effectiveness measure for this proposal is no better than 23%.

Our evaluation was based on a review of thousands of SDR entries and on the ATSRAC-produced Intrusive Inspection Report. In the NPRM, we did not assume that the rule would be 100 percent effective. Instead we measured expected effectiveness at 68%. The judgment used to evaluate EWIS failures in the regulatory evaluation refers to conclusions reached by experienced FAA and industry engineering and operational personnel reviewing operator-reported data and applying their considerable expertise to determine operational impacts of the EWIS conditions identified. In response to comment, we have re-evaluated the expected effectiveness and lowered it to 60%. Total potential benefits are multiplied by the 60% effectiveness measure to arrive at the expected total benefits. The initial and final regulatory evaluations provide a detailed description of how we arrived at 68% and 60% effectiveness rates. Despite the effectiveness measure decreasing from 68% (in the NPRM) to 60% (in the final rule), the total benefits increase. This is because the wiring problems were much greater than we originally estimated. Because of our comprehensive examination since the NPRM, we learned that there are more unscheduled landings and operational problems occurring from electrical wiring failures than originally included in our calculations. Since the NPRM we have analyzed all of the most recent data available.

Existing rules require operators to submit reports notifying the FAA of the occurrence or detection of failures, malfunctions, or defects in systems and components of aircraft. These service difficulty reports (SDR) are filed when a system, component, or part of an aircraft, power plant, propeller, or appliance fails to operate in the normal or usual manner.

The FAA reviewed all of the most recent reports from operators. The most recent reports from operators demonstrate that failures of the electrical wiring interconnection systems (EWIS) are much greater than previously anticipated and estimated in the NPRM.

In our analysis, we quantify and estimate the economic impact that will occur when these electrical failures and malfunctions are averted. Although we categorize and quantify averting such failures as "operational benefits," the occurrence of these failures has a direct effect on passenger safety and such failures are often precursors to more serious events.

In the NPRM we forecasted 1,118 unscheduled landings caused by wiring problems; of which 760 (68%) would be averted. In addition to the averted unscheduled landings, we estimated 968 events would cause delays; of which 658 (68%) would be averted.

Based on the most recent data and our comprehensive review, in the final rule, we estimate roughly 2,202 unscheduled landings; of which 1,321 (60%) will be averted. In addition, there will be 13,649 electrical wiring failures that will have an operational impact; of which 8,189 (60%) will be averted.

Accordingly, operational benefits increased in the final rule from $192 million (NPRM estimate) to $506 million.

The revised safety benefits as reflected in the final rule are based on a revised effectiveness estimate of 60% and an updated forecast showing the trend of operators to use smaller aircraft with higher load factors. This caused an overall decrease in the estimated safety benefits as reflected in the final rule. A detailed discussion of the effectiveness determination can be found in the regulatory evaluation.

**6. Operational Impacts**

UPS requested that we remove the operational improvements portion of the benefits calculation and restrict cost calculations to tangible safety benefits versus direct compliance costs. The commenter stated that this change would reduce the overall benefit calculation by $192.3 million.

The commenter contrasted the following to justify this request:

- The proposal calculates that averting a 3.5 hour delay will save airlines $35,739.
- The calculation in the proposed rule for Fuel Tank Flammability Reduction (FTFR), dated November 2005, uses a delay cost of $24.43 per minute, so a delay of 3.5 hours yields an estimated cost of $5,130 per event.

UPS stated it is notable that the FAA cites the benefit of an averted delay in one proposed rule, and the cost of a similar delay in another. Both were open for comment at the same time. The commenter contended that the value of operational improvements is highly subjective, inconsistent, doesn't yield accurate results, and is specific to each operator.

Boeing commented that it is unusual that the FAA has included averted delays, unscheduled landings, and failures of in-flight entertainment systems, which are essentially airline economic concerns, as part of the benefits accruing from the proposed rule. Boeing noted that the FAA included these benefits because, to quote the NPRM, "delays and unscheduled landings contain safety risks for passengers and crew and increase the likelihood of a more serious event." This commenter questioned the relationship between these non-normal but safe events. It disagreed with their inclusion in this analysis as a method of justifying rulemaking. Boeing stated that in past endeavors, the FAA has not permitted Boeing use of these events as benefits.

We have decided to retain the operational impacts estimated in the benefit calculations. As prescribed by the Office of Management and Budget (OMB), the regulatory evaluation should attempt to quantify all potential real incremental benefits to society in monetary terms, and this includes operational improvements that would result from adoption of these

requirements. We have clarified our terminology since the NPRM. This final rule evaluates operational impacts.

The operational impacts ("delays" in the NPRM) that are quantified in the final regulatory evaluation of EAPAS/FTS cannot be compared with delays estimated in the Fuel Tank Flammability Reduction NPRM (FTFR). The estimates contained in FTFR include crew costs, ground handling costs, and fuel costs. The operational impact benefits for EAPAS/FTS evaluate impacts from operator equipment malfunctions and failures in wiring as reported by operators in SDRs.

Operational impacts caused by EWIS failures are more serious and have a higher cost impact than the delays characterized in the FTFR NPRM. Wiring failures have an immediate impact on operations and the model estimates them accordingly. Fuel tank inerting problems, addressed in FTFR, are not necessarily fixed immediately. The operational impact estimated in the regulatory evaluation for this rule uses operator reports of failures, malfunctions, or defects of systems and components of the aircraft. The five years of data and accompanying analysis is included in the final regulatory evaluation and in appendix C. These types of failures are more serious (in terms of cost and time) than the delay of $24.43 per minute as reported by ATA and used in that evaluation. The operational impacts (as estimated in the final regulatory evaluation) of wiring failures have safety impacts and increase the likelihood of a more serious event.

**7. Training Costs**

GE commented that training addressed in proposed AC 120-YY is commercially available, at $60 per employee trained, to be repeated biannually. It stated that costs of having employees occupied in training rather than production were not factored into our estimate. GE said the training it investigated involves 17 modules, at an average of 30 minutes each, resulting in 8.5 hours per trained employee, biannually, in addition to the $60 /employee/year. GE said the cost to operators and service shops of providing training is therefore $308/employee/year. US Airways stated that the average annual cost of $131,108 for developing a training program seems to be significantly below actual costs. United Airlines asked if operators will be expected

to follow proposed AC120-YY. It says “target level one” training alone takes 40 hours and the three hours quoted in the NPRM seems extremely low.

The FAA agrees that the required training might be available commercially. We base our cost estimates on module C of AC 120-94, which requires less intensive training than the program identified by commenters. The training required by this final rule does not apply to production personnel, but to maintenance and inspection personnel only, as required by § 121.375. Therefore we did not consider the cost of having production personnel in training. We believe that the training covered by Module C is the minimum additional training required to comply with the new EWIS inspection requirements. We estimated the time to conduct this training at 3 hours for target groups 1, 2, 4, and 6, as provided by ATSRAC and stated in the initial regulatory evaluation. Training for the remaining modules and target groups is voluntary and not required for compliance with this final rule. No changes were made as a result of these comments.

RAA stated that using care when working around wiring, being knowledgeable about electrical systems, and teaching technicians that a maintenance/alteration task is not complete until the area is thoroughly cleaned are simply common sense and need not be mandated. The commenter expressed confidence these maintenance practices already exist among its members, and said that specific retrofit requirements can be more efficiently mandated by Airworthiness Directives.

RAA said one member suggested it would enhance its training not on how to develop inspection programs, but as a preventative maintenance aide for technicians. The commenter suggested the FAA (with industry assistance) issue an “Electrical Systems Installation & Repair Standard Practices Hand Book” that supplements or replaces the sections in AC 43.13, along with video training modules. RAA suggested that training on concepts like proper routing of wire bundles with sufficient supports that are not so tight as to increase the possibility of chafing within the bundle would be more beneficial than inspecting after the fact. The commenter said

that availability of quality training to many technicians will result in a cultural change in the industry that can roll over to other practices.

The final regulatory evaluation clearly shows that the benefits exceed the costs of the proposed EWIS maintenance requirements. As stated in the NPRM preamble discussion, investigations of previous accidents and examinations of other airplanes shows that deteriorated wiring, corrosion, improper wire installation and repairs, and contamination of wire bundles with various contaminants are common conditions in today's transport category fleet. Current maintenance practices do not adequately address wiring components, wiring inspection criteria are too general, and unacceptable conditions, such as improper repairs and installations, are not described in enough detail in maintenance instructions. We commend the RAA member airline for volunteering to enhance its EWIS training program and we encourage other companies to do the same. A complete EWIS training course, developed by ATSRAC, is contained in AC 120-94. Also, we have produced a course on good wiring practices which is available to the public through our Oklahoma City training center.

**8. Costs for EZAP Analysis and Inspection of Engines**

GE commented that reviewing an engine manual to identify tasks that touch or approach wiring is estimated at 160 hours. Checking a manual for the 41 items listed on pages 10-11 of proposed AC120-XX (this material is now in the DAH EZAP AC), for each of the 14 harnesses per engine, is estimated at 40 hours. It estimated compliance costs to GE at $438,000. GE stated that incorporating all 41 elements on pages 10-11 of proposed AC120-XX into a C-check would increase C-check time by a minimum of 1 day, resulting in 15,000 extra days of maintenance a year for operators, at a cost of $150 million annually.

Our final regulatory evaluation accounts for additional cost estimates in part due to the comments received from the engine manufacturer. Since we are not making any changes to part 33, engine manufacturers will not be required to perform an EZAP. The FAA disagrees with GE's estimate because airplane manufacturers have already completed EZAP analyses on existing airplanes without support from engine manufacturers.

We do not concur with GE's statement that performing an EZAP on engine-mounted EWIS components will result in an additional day being added to the length of a C-check (assuming that the frequency of the maintenance tasks require them to be completed on a C-check cycle). Based on data provided by one airplane manufacturer, we estimate that an additional 1 to 3 inspection tasks per engine will be necessary based on the results of applying EZAP to the engine zone. Since we anticipate that these additional tasks will be incorporated into scheduled maintenance down-times, no additional time for gaining access to the engines will be required. We expect that these additional tasks will be performed during scheduled maintenance visits and the corresponding costs are contained in the cleaning, inspection, and downtime sections of the regulatory evaluation.

GE contended that supporting manufacturer compliance with proposed subpart I (now part 26) will involve an estimated 240 work days, or $140,000, plus travel expenses of $100,000, per program. Even with cost savings for technically similar engines, GE said its costs for the DAH requirements would be $3,600,000.

Airplane manufacturers have already completed EZAP analyses on several different models of aircraft, and engine manufacturers have not provided support for these activities. We are not making any changes to part 33. Engine manufacturers are not required to support airframe manufacturers in complying with this final rule for either existing or future certification programs.

**9. Engine Costs for § 25.1362**

GE commented that costs of § 25.1362 were not addressed. As discussed previously, this rule requires that a suitable electrical supply be provided to those services required for emergency procedures after an emergency landing or ditching. GE stated that because very low levels of electrical energy can ignite fuel under laboratory conditions, it is not clear that any electrical supply to the fuel shut-off valve could be predicted to meet this rule. GE suggested that one way to comply would be by substituting a mechanical cable for the electrical signal to the engine fuel shut-off valve. It stated that such a cable, extending from the engine to the

wing/body join, would increase costs by approximately $20,000 per engine installation. It would also be less reliable, leading to an incremental unreliability of 0.4 cable seizures per million attempted engine shutdowns, and incremental maintenance costs. GE estimated an average annual cost to operators of $1,000,000.

We do not concur with GE's cost estimate for § 25.1362 compliance. GE interpreted the requirement to mean that electrical faults must be minimized to prevent them from causing a fire. The FAA's intent here is to ensure that there is necessary electrical power available to allow the emergency service equipment, such as a fuel shut-off valve, to operate after an emergency landing or ditching. Also as discussed previously, we have revised final § 25.1362 to clarify this point. We made no changes due to this comment.

**10. Wire Labeling Costs**

GE commented that the cost estimate for the labeling requirements of § 25.1711 appears based on mechanics adding labels during final assembly. GE stated that identifying wires at 15-inch intervals requires many more than the estimated 3,500 labels per airplane. Since fly-by-wire aircraft typically contain 100 miles of wiring, a label at 15-inch intervals equals over 422,000 labels per aircraft. GE stated that manufacturing wire with labels is more practical but would require that manufacturers invest in more tooling, plus drawing changes to harnesses and cables. GE estimated its cost at $9,300,000 over 25 years or $370,000 per year. Spectrum Technologies contended that the burden for wire identification labeling was significantly underestimated, particularly in relation to heat shrink labels and probably other types. The NPRM estimates a wire identification time of 30 seconds per label. Spectrum said that, based on industry practice, the time for heat shrink labeling is more like 240 seconds per sleeve.

In response to the estimated cost of $0.05 per label, Spectrum contended that the typical figure for industry brand name heat shrink labels is more like $1.50, depending on size. It said that the total cost of adding just one heat shrink sleeve can be calculated as $2.88.

The new rule does not require that additional labels be manually added to wiring. It only requires additional information to be included in the wire labeling that already exists. It appears

that the commenter assumes that there are no labeling requirements in effect today. Section 25.1301 already requires that components be identified. The requirement contained in this final rule expands on those requirements by imposing additional labeling requirements. Complying with § 25.1711 will be a matter of providing additions to, or changing the type of, information already on the EWIS labels that exist today. Based upon existing practices, our analysis estimates this additional cost.

Spectrum Technologies commented on the technical and economic advantages of a specific prescriptive means of compliance. Based on comments since the NPRM, we have verified our estimates. While we disagree with the specific estimates in the illustrative comment, we believe that manufacturers will demonstrate compliance using the most efficient and cost effective technology available.

**11. Additional Certification and Operator Costs**

Boeing and AIA/GAMA commented that we failed to account for additional certification costs in complying with the new requirements in subpart H and supporting all subpart H requirements for amendments to existing type certificates. Boeing maintained that the FAA should account for these costs, as well as:

- Additional "ongoing coordination necessary to ensure ongoing communication and cooperation between the applicants and the FAA" described in draft Advisory Circular 25-XX
- Costs borne by DAHs to perform the EZAP process detailed in draft Advisory Circular 120-XX (now in the DAH EZAP AC).
- Most importantly, increased costs associated with enhanced maintenance of wiring on all in-service airplanes.

Boeing asked that we include these costs in the analysis to get a true understanding of the burden associated with the projected benefits of the proposed rule. AIA/GAMA requested we include costs to operators for enhanced EWIS maintenance and updated labor rates for engineers as well as these additional items:

- Additional DAH manufacturing costs for future part 25 TC and STC products that include new subpart H (regardless of seating capacity).
- Training for maintenance personnel. This should include existing airplanes subject to new §121.911 (now §121.1111), §125.507, and §129.111 EWIS ICA requirements as well as future airplanes that include new subpart H and associated EWIS ICA requirements.
- Additional general aviation operator (part 91/135) costs associated with enhanced maintenance of EWIS on all future airplanes that include new part 25 subpart H and associated EWIS ICA requirements. This should consider additional airplane down time and necessary training for maintenance personnel.
- Additional repair station costs to update FAA-approved maintenance training manuals and provide training to their maintenance personnel.

In response to these comments, the FAA estimates the costs for ongoing coordination necessary to ensure ongoing communication and cooperation between the applicants and the FAA. Neither the preliminary nor final regulatory evaluation includes cleaning and inspection costs for deliveries of future aircraft operated in parts 91 and 135 because there is no operational requirement to do so. Other than the increased cost of EWIS component identification addressed in the regulatory evaluation, we believe that there will be minimal additional manufacturing costs associated with complying with the new EWIS certification requirements.

As in the preliminary regulatory evaluation, we continue to estimate the following costs:

- Subpart H TC certification costs.
- Subpart H STC certification costs.
- EZAP costs for existing TCs, future TCs, and future STCs..
- SWPM update costs.
- EWIS identification costs for TCs and STCs.
- Training costs for maintenance personnel.
- Planning costs to Part 121 operators.

- Cleaning /inspection costs to part 121 operators.
- Downtime costs to part 121 operators.

**12. Previous Rulemaking**

The RAA requested that the cost-benefit analysis be revised to account for previous rulemaking actions that mitigate likelihood that an accident/incident similar to those that prompted this rulemaking action will occur in the future. The RAA requested that if benefits of a revised cost-benefits analysis are less than the cost of adopting the operating rule, proposed Part 121 & 129 affecting the current fleet be withdrawn.

The commenter considered the benefits analysis a "double count," or a count of the same fatalities as a benefit in future accident avoidance as were counted to justify previous rulemaking. It stated that industry has spent millions of dollars in fleet retrofit and inspection improvements, mostly mandated by rulemaking, and there has been a dramatic decrease in the accident rate despite increased fleet growth. RAA said the estimated 5.3% ratio of accidents to incidents has changed dramatically in the last 10 years, but the benefits analysis does not acknowledge this.

GE stated that the benefit claimed for this rule does not account for previous rules introduced to address the MD11 in-flight fire and accident, specifically the rule on cabin insulation materials. GE said that the effect of that rule was to prevent wire arcing from propagating into a fire within the pressurized fuselage, by removing flammable materials. The commenter argues that since significant measures have already been taken to prevent a recurrence of this kind of accident, the benefit claimed for the EAPAS rule package should be reduced accordingly, but says is not clear whether this has been done.

The cost-benefit analysis evaluates the risk of passenger deaths associated with wiring failures. We analyze the historical number of wire failures and evaluate them in the context of this rulemaking. The accidents and incidents listed in appendix B of the preliminary regulatory evaluation included neither TWA 800 nor Swissair 111, so we have not "double counted" benefits as the RAA contends.

Although we have issued various ADs and other rules dealing with flammability of insulation blankets, those rules do not address the issue of wire contamination that can also be a source of fuel for on-board fires. Adoption of EAPAS will help minimize likelihood of an on-board fire due to wire contamination and wire failures.

We continue to observe an overall increase in wire-related failures as demonstrated in EWIS SDRs, accidents, and incidents. Although wire type and insulation materials have evolved over the years, the means to design, install, and maintain EWIS remain much the same. To reduce occurrences of wire-related incidents and accidents, it is necessary to adopt the requirements contained in this final rule.

**13. Relevance to the Current Fleet**

The RAA requested that we revise the cost-benefit analysis to determine relevance of the ASTRAC analysis to the current fleet. It stated that the analysis and recommendations were largely based on inspections of wiring on decommissioned airplanes that at the time (1998) were older than 20 years (DC-8, DC-9, DC-10, 727, etc.). The RAA estimated that those airplane wiring systems were certified at least 50 years ago, and since then aircraft wiring systems have improved. It further stated that the analysis estimates such airplanes represent less than 1% of the current fleet. The commenter asked how we can imply that ASTRAC's analysis has any relevance to today's fleet.

The RAA also questioned the validity of using a 25-year period for determining benefits. It questioned projecting 25 years into the future to justify benefits for a retrofit rule and stated that all other retrofit rules have projected 10 to 20 years. The RAA called it unrealistic to use an accident/incident review for older aircraft projected to be retired from service before the end of the 25-year amortization period.

We believe that ATSRAC's analysis is relevant to today's fleet. The regulatory evaluation cites ATSRAC's non-intrusive inspection report finding 3,372 total discrepancies during the non-intrusive wiring inspections of 81 airplanes The "effectiveness measure" looks at continuing failures, malfunctions, or defects in the current fleet as reported by operators, and

evaluates them with respect to the Intrusive Inspection Report. This final rule will change the certification, design, installation, and maintenance practices for EWIS, which, up to this time, have changed very little since the jet age began. In addition, the physical environments in which wires are installed and the types of hazards they are exposed to are very similar regardless of airplane age. At the same time, airplane designs have become more vulnerable to EWIS safety problems because they are more dependent on electrical systems and less dependent on mechanical systems, as in the case of electronic flight control systems.

We chose the 25-year benefit period because we expect, on average, that a newly manufactured airplane would be in service for that period of time. There will also be airplanes delivered in the next 25 years that are impacted by these requirements. As stated in the preliminary regulatory evaluation the 25-year analysis parallels the expected useful life of an aircraft impacted by this proposal.

**14. Accidents Indirectly Initiated by EWIS**

The NTSB was concerned that the cost-benefit analysis does not account for indirect EWIS-initiated accident causes, such as those that occurred during the June 6, 1992, accident involving COPA flight 201 that crashed near Tucuti, Panama. For that accident, an instrument's gyroscope wire was believed to have frayed and shorted, leading to erroneous instrument indications and the pilots' loss of control of the airplane. The Board believes that the number of EWIS-related accidents and incidents that can be prevented will exceed that predicted by the FAA.

We acknowledge that functional effects of wiring failures may have contributed to additional incidents and accidents. Although additional benefits could be estimated for indirect causes, we have focused our analysis on direct causes only.

## I. Harmonization Changes to Transport Category Certification Rules (Part 25)

### 1. FAA/JAA (Joint Aviation Authority) Harmonization

At the time the EWIS certification requirements in this final rule were being developed, several existing part 25 certification requirements were also undergoing revision as part of a separate joint harmonization effort with the European JAA.[9] These rules were the result of an effort to develop a common, or "harmonized" set of standards between 14 CFR part 25 and JAR-25, which was then the European counterpart to part 25. Because this harmonization effort was essentially complete when drafting of this final rule began, the harmonized rules were used as the baseline for the new EWIS certification rules. The harmonized rules are finalized here. This final rule also further revises several of the harmonized rules to accommodate the new EWIS requirements.

We received no comments about sections 25.899, 25.1309, and 25.1310. They are finalized here in the same form in which they were proposed.

### 2. Circuit Protective Devices (§ 25.1357)

Section 25.1357 specifies standards for use, functional requirements, and installation requirements for electrical circuit protective devices. These standards protect the airplane's wiring from electrical faults or malfunctions. JAR paragraph 25.1357(d) contains a requirement to provide sufficient spare fuses, formerly located in paragraph (f). The reason the JAA moved this text from paragraph (f) to (d) was to make it clear that the spare fuse requirement does not apply to fuses that are inaccessible in flight. We are moving the spare fuse requirement of paragraph (f) to paragraph (d) to harmonize with the JAR requirement. This rule continues to

[9] The JAA is the Joint Aviation Authority of Europe and the JAR is its Joint Aviation Requirements, the equivalent of our Federal Aviation Regulations. In the time since these rules were developed, in 2003, the European Aviation Safety Agency (EASA) was formed. EASA is now the principal aviation regulatory agency in Europe, and we intend to continue to work with EASA to ensure that this rule is also harmonized with its Certification Specifications (CS). But since the harmonization efforts involved in developing these rules occurred before EASA was formed, it was the JAA that was involved with them. So while the JAR and CS are essentially equivalent, and in the future we will be focusing on the CS, it is the JAR that will be referred to in the historical background discussions in this final rule.

address the underlying safety issue by providing protection for the airplane's electrical system from wiring faults or malfunctions, and by ensuring that there is no confusion about use of spare fuses in flight.

In addition to the harmonization changes we made to § 25.1757, we also added a requirement that airplane systems normally requiring power removal have a power switch to accomplish this, instead of relying on using the circuit breaker.

Continental Airlines asked if the prohibition against circuit breaker use as the primary means of power removal or reset during normal operations applies to existing STC installations or to future amendments to existing STCs.

Section 25.1357(f) will not require an existing installed STC system to be changed. As with any other change to the airworthiness standards of part 25, whether future amendments to those STCs would be required to comply with the requirements of § 25.1357(f) would be determined in accordance with § 21.101.

AIA/GAMA and GE requested that we clarify what is meant in § 25.1357(f) by "normal operation." They asked whether consideration for the need of a switch extends to non-normal or emergency situations.

It is not the intent of the requirement that every electrically powered system in the airplane have a means to remove power other than a circuit breaker. We distinguish between airplane systems normally turned on and off during normal operations, such as passenger convenience systems, and those systems normally powered at all times, such as flight deck multi-function displays or the flight-management computer. But if, for example, the flight-management computer requires power cycling regularly as a part of normal operations, this system would also be required to have a means to do this other than using circuit breakers that are not specifically designed for use as a switch. Non-normal or emergency situations do not need to be considered when determining the need for a switch.

**3. Precautions against Injury (§ 25.1360)**

Section 25.1360 is a new rule requiring that the electrical system and equipment be designed to minimize risk of electrical shock and burns to the crew, passengers, and maintenance and servicing personnel during normal operations. This rule adopts the current JAR standard and is in line with current industry practice. It is unchanged from the form in which it was proposed.

AIA/GAMA and GE requested that the term "maintenance" in § 25.1360 be limited to line maintenance.

We infer from GE's comment that it wants § 25.1360 amended to revise the phrase "maintenance personnel" to read "line maintenance personnel." We are not adopting GE's request. We believe the intent of the requirement is clear because of the phrase "using normal precautions." Maintenance personnel, whether working line or shop maintenance, are trained to use caution when working on, or around, live electrical circuits. Section 25.1360 requires, in part, that the airplane's electrical system be designed so that shock hazards to maintenance personnel are minimized when they are taking normal precautionary measures to avoid shock hazards. We made no changes due to this comment.

**4. Electrical Supplies for Emergency Conditions (§ 25.1362)**

Section 25.1362 is a new rule that duplicates current JAR standards. It requires that a suitable electrical supply be provided to those services required for emergency procedures after an emergency landing or ditching. The circuits for these services must be designed, protected, and installed so that risk of the services being rendered ineffective under these emergency conditions is minimized. Section 25.1362 has been changed from the form in which it was originally proposed in order to clarify meaning, as discussed below.

Boeing Wichita requested that we clarify what is meant by the words "protected" and "minimized." Honeywell and GE asked that the second sentence of the section be deleted. They said there is no clear approach to providing electrical power to the fuel shut-off valve on an engine or APU without potential for it being an ignition source after an emergency landing. They suggested wording could be added to AC 25.1362-1X as follows:

> Use of the normal aircraft supply voltage has been found to acceptably minimize the risk of fire.

We do not agree to delete the second sentence of § 25.1362. The intent of the requirement is to prevent disconnection of the electrical supply to the required services before the emergency procedures are completed. The concern of this rule is not that the circuits are the source of the fire but rather that they be capable of shutting off the services that could contribute to the fire. We concur with Boeing Wichita's request to clarify the intent of the requirements and we have revised the final § 25.1362 to do this. We have also revised the associated advisory circular to clarify appropriate means of compliance.

**5. Electrical Appliances, Motors, and Transformers (§ 25.1365)**

Section 25.1365 is a new rule within the "Miscellaneous Equipment" section of subpart F concerning design and installation of domestic appliances, electrical motors, and transformers. The term "domestic appliance" is used to refer to those items placed on the airplane to provide service amenities to passengers. Examples of domestic appliances are cooktops, ovens, microwave ovens, coffee makers, water heaters, refrigerators, and toilet flush systems. Section 25.1365 requires that domestic appliances be designed and installed so that in the event of failures, the requirements of §§ 25.1309(b), (c), and (d) would be satisfied. It requires that galleys and cooking appliances be such as to minimize risk of overheating or fire and that they be installed to prevent damage or contamination of other equipment from fluids or vapors resulting from spillage during use of the appliances. It also requires that all electric motors and transformers be provided with a thermal protection device unless it can be shown that the circuit protective device required by § 25.1357(a) would be sufficient to show compliance with requirements of § 25.1309(b). We made no changes to this rule.

Honeywell and GE requested that we change the wording of § 25.1365(d) to limit it to motors and transformers for domestic systems.

We have decided against limiting applicability of § 25.1365(d) to domestic appliances. Our intent is that § 25.1365(d) apply to all motors and transformers on the airplane. While the NPRM only discussed domestic appliances, the risk of smoke or fire hazard addressed by this paragraph is not limited to domestic appliances. The exception to this would be if a circuit protective device is shown to negate the need for the thermal protective device (as allowed by the rule language). We would anticipate that engine- and APU-mounted motors and transformers would fall into this category because adding thermal protection devices in those cases could negatively impact the reliability of those devices. The intended scope of this paragraph is apparent both from the rule language and from the advisory material for that section:

> Section 25.1365(d) is broader in scope [than just domestic appliances] and requires that all electric motors and transformers, including those on domestic appliances, have a thermal protection device ….

## J. Additional Certification Rule Changes

### 1. Rules Changed to Accommodate Subpart H

To create the new subpart H as the single place for the majority of wiring certification requirements, some existing requirements applying to wire were moved out of the rules in which they currently exist and placed in the new subpart. The rules of which those EWIS requirements were previously a part or which were the basis of a new EWIS requirement have thus been revised to support the new EWIS subpart. They are:

- § 25.611
- § 25.855
- § 25.869
- § 25.1203
- § 25.1301
- § 25.1309
- § 25.1353

- § 25.1357

We did not receive any comments about most of these rule revisions, and they are finalized here in the same form in which they were proposed. Some rules received minor editorial changes that did not change their meaning and do not require discussion here. We did receive comments about § 25.1353 and made revisions to it, as discussed below.

**2. Electrical Equipment and Installations (§ 25.1353)**

Section 25.1353 requires that electrical equipment and controls must be installed so that operation of any one unit or system of units will not adversely affect the simultaneous operation of any other electrical unit or system essential to safe operation. Any electrical interference likely to be present in the airplane must not result in hazardous effects upon the airplane or its systems. Section 25.1353 is revised to remove references to wiring and cables to accommodate the relocation of wiring requirements to the new subpart H. We've further revised this rule in response to comments and to avoid redundancy.

AIA/GAMA and GE requested that we delete the reference to § 25.1357 from proposed § 25.1353(b). We agree that the proposed § 25.1353(b) references to § 25.1357 and the subpart H requirements are unnecessary. Section 25.1301(b) requires that EWIS meet requirements of subpart H of part 25. So the reference to some of those requirements in proposed § 25.1353(b) is redundant. The reference to § 25.1357 in § 25.1353(b) is not necessary because § 25.1717 requires that electrical wires and cables be designed and installed so they are compatible with the circuit protection devices required by § 25.1357. We've amended the final rule to reflect this.

Boeing Wichita asked, in regard to § 25.1353(a), that we clarify whether "any electrical interference likely to be present on the airplane" is limited to items approved for installation, or includes anything likely to be carried onto the airplane, like customer printers and fax machines.

This rule applies to equipment that is installed and certified to part 25. It does not cover interference that may come from items carried on board by people. Operational rules cover such items (i.e., §§ 121.306, 125.204, 135.144).

U.S. Airways asked that we clarify the electrical bonding requirements in § 25.1353. It contended that, by definition, the bonding point is part of the EWIS and as such could be the fault. In that instance it would not provide the required return path.

The intent of the requirement is that electrical return paths be adequately sized and properly installed to handle the highest normal and fault current levels that would be expected to occur. The requirement is not addressing a fault of the bonding path itself.

## IV. REGULATORY NOTICES AND ANALYSES

### Paperwork Reduction Act

As required by the Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)), the FAA submitted a copy of the new information collection requirements in this final rule to the Office of Management and Budget for its review. OMB approved the collection of this information and assigned OMB Control Number 2120-0723.

This final rule consists of regulatory changes applying to wiring systems and fuel tank systems in transport category airplanes. Some of those changes will require new information collection. Comments received about these requirements and the FAA's response are discussed earlier in this document, under the Disposition of Comments section. The new information requirements and the persons who would be required to provide that information are described below.

### Required information, use, and respondents

(1) Section § 25.1711 requires that electrical wiring interconnection systems (EWIS) components be labeled to identify the component, its function, and its design limitations, if any. If the EWIS is part of a system that requires redundancy, the labeling must also include component part number, function, and separation requirements for bundles. This specificity of labeling will be required to ensure that maintenance can be handled properly and with the appropriate caution for maintaining the safety features the wiring system was designed to provide. The information marked on the wires will be used by maintenance personnel for repair and cautionary tasks, and by modifiers so that original safety features are retained during

modifications. The future airplane manufacturer and anyone who modifies the airplane will bear the burden of this labeling requirement.

(2) Section § 26.11 requires that existing TC holders develop Instructions for Continued Airworthiness (ICA) for EWIS, and that those ICA be approved by the FAA. Applicants for approval of design changes will be required to develop revisions to those EWIS ICA for any modifications to the airplane that might affect them. Section § 25.1729 and Appendix H will apply the requirement for EWIS ICA to future applicants for TCs. EWIS ICA will be used by operators to prepare their maintenance programs. This requirement is necessary to ensure that wiring is properly maintained and inspected to avoid problems that could affect safety.

(3) Section 26.11 will also require that TC holders submit to the FAA a plan detailing how they intend to comply with its requirements. This information will be used by the FAA to assist the TC holder in complying with requirements. The compliance plan is necessary to ensure that TC holders fully understand the requirements and are able to provide information needed by the operators for the operators' timely compliance with the rule.

(4) Anyone operating an airplane under part 121 will be required to revise their existing maintenance program to incorporate the maintenance and inspection tasks for EWIS contained in the EWIS ICA. The information incorporated into the maintenance program will be used by maintenance personnel to maintain the integrity of airplane wiring systems. This requirement is necessary to ensure that wiring is properly maintained and inspected to avoid problems that could affect safety.

(5) As a result of the revised maintenance programs that will be required for airplanes operating under part 121, maintenance personnel will be performing inspections and maintenance procedures to address safety issues specific to wiring systems. Although this final rule does not specifically require new training, existing § 121.375 requires that certificate holders or persons performing maintenance have a training program to ensure that persons determining the adequacy of such work (including inspectors) are fully informed about the procedures and

techniques involved and are competent to perform them. To comply with this requirement in relation to requirements for revised maintenance programs for EWIS included in this final rule, certificate holders will be required to develop any additional training program needed to ensure that the appropriate personnel are adequately prepared to carry out the revised maintenance programs.

(6) The revision to part 25 Appendix H requires that future manufacturers include acceptable EWIS practices in their ICA, presented in a standard format. This information will be used by maintenance personnel for wiring maintenance and repairs. The requirement is necessary because information about cautionary tasks during maintenance that can prevent situations that could compromise safety need to be available to maintenance personnel. Standard wiring practices manuals, in which this information is presented, often differ from manufacturer to manufacturer and so are difficult for maintenance personnel to find specific information in. The requirement for a standard format is meant to correct this. Because of this rule, manufacturers will change their Standard Wiring Practices Manuals (SWPM).

**Annual Burden Estimate**

To provide estimates of the burden to collect information, the FAA developed categories. The following summary table contains the impacted entities, average annual hours and the corresponding average annual cost. Details of the estimates are in the paragraphs below.

| | Requirement/Entities Affected | Annual Hours | Annual Cost |
|---|---|---|---|
| 1a | TC Labeling - Hardware | -- | $21,525 |
| 1b | TC Labeling - Labor | 1,788 | $89,400 |
| 1c | STC Labeling - Hardware | -- | $83,688 |
| 1d | STC Labeling - Labor | 6,953 | $347,634 |
| 2a | Existing TC Holders - EZAP | 11,450 | $858,720 |
| 2b | Future TC Applicants - EZAP | 7,156 | $536,700 |
| 2c | Future STC Applicants - EZAP | 6,283 | $471,225 |
| 2d | ICA Approval | 96 | $7,200 |
| 3 | Compliance Plan Development | 128 | $9,600 |
| 4 | Operators Revise Maintenance Program | 2,550 | $191,268 |
| 5 | Training Development | 2,208 | $165,600 |
| 6 | SWPM | 734 | $55,040 |
| | **Total** | **39,346** | **$2,837,600** |

1a. The FAA estimates that an additional 3,500 labels might be installed in each newly certificated part 25 airplane. We calculate hardware costs by multiplying 3,500 labels per airplane by 5 cents per label, and then by the total annual estimated deliveries (123) of affected aircraft. Thus, the annual cost for TC identification hardware is $21,525.

1b. With 3,500 labels installed in 123 affected aircraft annually, we estimate a total of 430,500 labels. The total estimated annual average hours are 1,788. Using the burdened hourly cost for a mechanic ($50), the annual labor cost burden for TC identification is $89,400.

1c. The requirements contained in this final rule will also affect airplane modifiers when electrical wiring supplemental type certificates (STC) are installed on airplanes. We estimate that approximately 103 STCs a year will require additional identification of roughly 250 additional labels (.05 per label) per STC installation. Since we estimate 250 labels at .05 per label, each STC installation will cost an additional $12.50. The annual hardware cost of $83,688 is estimated by multiplying the number of STCs (103) by the number of airplane installations per STC (65) and finally by the additional hardware cost of $12.50.

1d. For the STC identification labor costs, we estimate roughly 1,673,750 additional labels will be installed annually (103 STCs X 250 labels X 65 aircraft). The identification requirements for STCs will require an annual burden of approximately 6,953 hours. Using the burdened hourly cost of a mechanic ($50), the annual labor cost for the identification requirement to airplane modifiers is $347,634.

2a. Part 26 requires TC holders to perform an EZAP analysis to develop Instructions for Continued Airworthiness (ICA) for EWIS. Over the period of analysis, the FAA estimates the proposal would require 11,450 average annual engineering hours resulting in the average annual cost of $858,720 (using the fully burdened hourly rate of $75 for an engineer).

2b. Future TC applicants will also perform an EZAP analysis to develop ICA for EWIS. The FAA estimates one part 25 type certificate per year, with the estimated average annual labor hours to perform the analysis of 7,156. This would result in average annual costs of $536,700.

2c. Future applicants for supplemental type certificates will also perform an EZAP analysis to develop ICA for EWIS. The total annual number of affected STCs is 103. The annual burden hours of 6,283 is calculated by multiplying the annual number of STCs (103) by the hourly estimate to perform EZAP on an STC (61). Using the estimate of 61 hours per STC and the burdened hourly cost of $75, the corresponding costs to perform EZAP on 103 STCs annually will be $471,225.

2d. The FAA estimates 60 labor hours (per airplane model) to submit ICA to the FAA for approval. The FAA estimates 2,400 hours for roughly 40 models. The average annual hours are 96, with corresponding average annual costs of $7,200 (using the burdened hourly cost of $75).

3. Manufacturers will present a compliance plan for approval describing how they intend to comply with the requirements in the final rule. Over the period of analysis, the average annual estimated cost to the manufacturer to develop the compliance plan is $9,600, with annual hours of 128.

4. Operators will revise their existing maintenance program to incorporate the maintenance and inspection tasks for EWIS contained in the ICA. Over the period of analysis, the FAA estimates 63,756 total hours, or 2,550 average annual hours required to revise existing maintenance programs. Using the burdened labor cost for an engineer, the average annual planning cost is $191,268.

5. The estimated cost to develop training considers the industry's standard training factor of 200 hours per one hour of prepared training material. 600 hours is the estimated training development time for the 3-hour training course for each operator. When combined with 92

operators, the total hours would be 55,200 or 2,208 annually. Combined with the burdened hourly cost of $75, the average annual cost for training development would be $165,600.

6. Manufacturers will change the Standard Wiring Practices Manual (SWPM). The FAA calculates 734 as the average annual hours required to update manuals resulting in the average annual burden of roughly $55,040.

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.

**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**

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 (Public Law 96-354) requires agencies to analyze the economic impact of regulatory changes on small entities. Third, the Trade Agreements Act (Public Law 96-39) 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, that they be the basis of U.S. standards. Fourth, the Unfunded Mandates Reform Act of 1995 (Public Law 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 with base year of 1995).

In conducting these analyses, the FAA has determined that this final rule: (1) has benefits that justify its costs; (2) will not have a significant economic impact on a substantial number of small entities; (3) will not create unnecessary obstacles to the foreign commerce of the United States; and (4) will not impose an unfunded mandate on state, local, or tribal governments, or on the private sector by exceeding the threshold identified above. While this rule is not economically significant as defined in section 3(f) of Executive Order 12866 or in DOT's Regulatory Policy and Procedures, it is otherwise significant under both documents. Accordingly, the rulemaking package has been reviewed by OMB. These analyses are summarized below.

**Total Costs and Benefits of this Rulemaking**

The total estimated cost of this final rule is $416 million ($233 million present value). The total estimated benefits are $801 million ($388 million present value). In the NPRM, we examined certain specific (narrower) categories of operational benefits for the operators. Since the NPRM, and at the request of commenters, we have performed an all-encompassing and exhaustive review of all wiring failures as required to be reported by the operators. This review demonstrated that airline operational impact from electrical wiring interconnection system (EWIS) failures alone was greater than previously anticipated and estimated in the NPRM. Appropriately, in this final rule, we estimate the higher benefits.

| Cost Category | Nominal Values (in millions) | Present Value (in millions) |
|---|---|---|
| Harmonization | $- | $- |
| Part 25 Subpart H- Certification | $68.1 | $35.6 |
| Part 25 Subpart H- Engines | $31.6 | $26.6 |
| Part 26 ICA | $22.9 | $22.1 |
| Part 121 ICA Operater Cost | $292.2 | $147.6 |
| Approval Cost | $1.7 | $1.4 |
| **Total Cost** | **$416** | **$233** |
| Benefit Category | Nominal Values | Present Values |
| Total Operational Benefits | $506.3 | $237.5 |
| Total Safety Benefits | $294.6 | $150.6 |
| **Total - All Benefits** | **$801** | **$388** |

*minor differences in totals due to rounding

Who Will Be Affected by this Rulemaking?

- Manufacturers of Part 25 Airplanes
- Operators of large transport category airplanes
- Part 25 applicants
- Engine Manufacturers

Assumptions and Sources of Information

- Discount rate –7%
- Period of analysis – 25 Years, 2006 through 2030
- Burdened labor rate (as shown in key assumptions and labor rates in regulatory evaluation)
  - Aerospace engineers - $75/hour

- Maintenance personnel- $50/hour

- Value of fatality avoided - Value of fatality avoided - $3.0 million (Source: "Revised Departmental Guidance, Treatment of Value of Life and Injuries in Preparing Economic Evaluations," Office of the Secretary of Transportation Memorandum", January 29, 2002)".Value of Life and Injuries in Preparing Economic Evaluations," Office of the Secretary of Transportation Memorandum", January 29, 2002).
- Fleet-Safety Performance Analysis System (SPAS)
- Fleet Growth (2.8% per year) & Passenger Occupancy Rates - FAA Aerospace Forecasts Years 2006-2017
- Failures, Incidents and Accidents - The National Aviation Safety Data Analysis Center
- Aircraft Value - Economic Values for Evaluation of Federal Aviation Administration Investment and Regulatory Programs 1998

Articles Referenced

- Irrgang, M.E. "Airline Irregular Operations" Handbook of Airline Economics, 1995.
- Wojcik, Leonard A. "Models To Understand Airline and Air Traffic Management Authority Decision-Making Interactions in Schedule Disruptions: From Simple Games to Agent-Based Models," Handbook of Airline Strategy, 2001.
- Wright, T.P. "American Methods of Aircraft Production" 1939.

**Alternatives We Considered**

Alternative 1 – Require operators to clean & inspect each airplane every C-check or every three years. This would result in an estimated additional $179.3 million ($72.2 million present value) in cleaning and inspection costs, and an additional $88 million ($31.6 million present value) in downtime. This alternative would result in additional costs of $251.5 million ($120.3 million present value) with no commensurate increase in benefits.

Alternative 2 – Explicitly require EWIS training for other groups of people in addition to maintenance workers. The groups and additional costs are:

- Flight deck crew- $126 million ($76 million present value)
- Cabin crew- $63 million ($38 million present value)

The total estimated additional cost of this alternative is roughly $189 million ($113 million present value) with no commensurate increase in benefits.

Alternative 3- No new regulation (status quo)-

There was a midair explosion in 1996 involving a 747 airplane. Two years later, another commercial airplane (an MD-11) crashed into the Atlantic Ocean, killing all 229 people aboard. The investigations and later examinations of other airplanes showed deteriorated wiring,

corrosion, improper wire installation and repairs, and the contamination of wiring in commercial aircraft. We have observed and analyzed a continuing trend in electrical wiring events. The continuance of these events is demonstrated in accidents, incidents, and service difficulties that endanger passengers. The FAA believes that this trend of events is unacceptable, that this rulemaking is necessary to improve aviation safety, and that this final rule will decrease the frequency of these events. By introducing the new maintenance, inspection, and design criteria for airplane wiring contained in this final rule, we are ensuring that there will be a substantial decrease in the number of electrical-wiring-related accidents and incidents, and thereby an increase in aviation safety.

**Benefits of this Rulemaking**

The FAA estimates $801 million ($388 million present value) as the total benefits of this final rule. In the table below, the categories of benefits are shown. The middle column gives the nominal values of quantified benefits, and the right-hand column gives the total incremental present value benefits broken down by category type.

**Costs of this Rulemaking**

The FAA estimates $416 million ($233 million present value) as the total cost of this final rule. The following table specifies the cost categories, incremental nominal costs and incremental present value costs.

| Benefits | Nominal Values (in millions) | Present Values (in millions) |
|---|---|---|
| **Operational Impacts** | | |
| Averted unscheduled landings | $274.3 | $128.8 |
| Other Operational Impacts | $232.0 | $108.7 |
| Total Operation Benefits | $506.3 | $237.5 |
| **Safety Benefits** | | |
| Averted Non fatal events | $44.4 | $22.7 |
| Averted Fatal events | $250.2 | $127.9 |
| Total Safety Benefits | $294.6 | $150.6 |
| **Total - All Benefits** | **$801** | **$388** |

| Cost Summary | | |
|---|---|---|
| **Cost** | **Nominal Values (in millions)** | **Present Values (in millions)** |
| Harmonization | $- | $- |
| Part 25 Subpart H- Certification | | |
| TC Certification Cost | $31.0 | $15.8 |
| TC- EZAP Future | $12.9 | $6.6 |
| STC Certification Cost | $11.3 | $5.8 |
| STC Labeling Hardware | $2.0 | $1.0 |
| STC Labeling Labor | $8.3 | $4.8 |
| TC Labeling Hardware | $0.5 | $0.3 |
| TC Labeling Labor | $2.1 | $1.2 |
| Total Certification Costs | $68.1 | $35.5 |
| Part 25 Subpart H- Engines | | |
| Engine Certification | $25.0 | $23.4 |
| Safey Analysis | $6.6 | $3.2 |
| Total Engine Costs | $31.6 | $26.6 |
| Part 26 ICA | | |
| EZAP | $21.5 | $20.8 |
| SWPM | $1.4 | $1.3 |
| Total Part 26 ICA Costs | $22.9 | $22.1 |
| Part 121 ICA Operater Costs | | |
| Planning | $4.8 | $4.2 |
| Training | $20.7 | $14.2 |
| Training Development | $4.1 | $3.6 |
| Cleaning & Inspections | $189.5 | $94.0 |
| Downtime | $72.1 | $31.6 |
| Total Operator Costs | $291.2 | $147.6 |
| Approval Costs | | |
| Approve EWIS ICA For Future TCs | $0.126 | $0.064 |
| Approve ICA For Existing TCs | $0.156 | $0.151 |
| Approve ICA for Future STCs | $0.556 | $0.284 |
| Approve Inspection & Maintenance Program | $0.828 | $0.801 |
| Compliance Plan | $0.240 | $0.232 |
| Total Approval Costs | $1.9 | $1.5 |
| **Total Costs** | **$416** | **$233** |

**Final Regulatory Flexibility Determination**

The Regulatory Flexibility Act of 1980 (Public Law 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.

We have conducted a complete regulatory flexibility analysis to assess the impact on small entities. The FAA uses the size standards from the Small Business Administration for Air Transportation and Aircraft Manufacturing specifying companies with less than 1,500 employees as small entities.

The FAA believes 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. The FAA has determined that:

- No part 25 manufacturers are small entities.
- There will not be a significant impact on a substantial number of amended TC or supplemental TC (STC) applicants.
- There will not be a significant impact on a substantial number of small carriers as a result of this final rule.

The current United States part 25 airplane manufacturers include: Boeing, Cessna Aircraft, Gulfstream Aerospace, Learjet (owned by Bombardier), Lockheed Martin, McDonnell

Douglas (a wholly-owned subsidiary of The Boeing Company), Raytheon Aircraft, and Sabreliner Corporation. These manufacturers will incur type certificate (TC) and amended TC costs. Because all U.S. transport-aircraft category manufacturers have more than 1,500 employees, none are considered small entities.

Future STC applicants will incur additional compliance costs. These applicants will incur the cost only if the applicant believes the expected revenue from additional sales will exceed the expected cost. While future STC costs will be passed on to airplane operators, it is not possible to determine operator would buy and install such STCs. Because expected revenue would be greater than the expected cost, the FAA believes there will not be a significant impact on a substantial number of STC applicants.

Furthermore, the FAA also calculates economic impact on small-business part 121 operators. We measured the economic impact on small part 121 operators by dividing the compliance cost by the firm's annual revenue. The impact of this final rule is below ½ of one percent for eighteen small entities where data was available. For the remaining 3, where data was available, the cost impact is 0.83%, 1.08% and 1.68% of revenues. Therefore, the FAA believes that this final rule will not have a significant economic impact on a substantial number of small-business part 121 operators.

The full regulatory flexibility analysis can be found in the final regulatory evaluation. No part 25 manufacturers are small entities, there will not be a significant impact on a substantial number of amended TC or STC applicants, and there will not be a significant impact on a substantial number of small operators. Therefore, as the Acting FAA Administrator, I certify that this rule will not have a significant economic impact on a substantial number of small entities.

**Final International Trade Impact Assessment**

The Trade Agreements Act of 1979 (Public Law 96-39) prohibits Federal agencies from establishing any standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. Legitimate domestic objectives, such as safety, are

not considered unnecessary obstacles. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards. The FAA has assessed the potential effect of this final rule and determined that it will impose the same costs on domestic and international entities and thus has a neutral trade impact.

**Final Unfunded Mandates Assessment**

Title II of the Unfunded Mandates Reform Act of 1995 (Public Law 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 (adjusted annually for inflation with the base year 1995) 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 $128.1 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, or the relationship between the national Government and the States, or on the distribution of power and responsibilities among the various levels of government, and therefore does not have federalism implications.

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, we requested comments on whether the proposed rule should apply differently to intrastate operations in Alaska. We did receive comments from Senators Stevens and Murkowski and Everts Air Cargo on this subject, as discussed earlier. Also as discussed earlier, however, we have determined that there would not

be an adverse effect on Alaska intrastate operators, the burden of this rule on affected intrastate operators in Alaska would be minimal, and based on the administrative record of this rulemaking, that there is no need to make any regulatory distinctions applicable to intrastate aviation in Alaska.

**Environmental Analysis**

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

**Regulations that Significantly Affect Energy Supply, Distribution, or Use**

The FAA has analyzed this final 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 energy action" under Executive Order 12866, and it is not likely to have a significant adverse effect on the supply, distribution, or use of energy.

**Availability of Rulemaking Documents**

You can get an electronic copy using the Internet by –

(1) Searching the Federal eRulemaking Portal http://www.regulations.gov

(2) Visiting the FAA's Regulations and Policies web page at http://www.faa.gov/regulations_policies/; or

(3) Accessing the Government Printing Office's web page at http://www.gpoaccess.gov/fr/index.html.

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

Anyone is able to search the electronic form of all comments received into any of our dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, etc.). You may review DOT's complete Privacy Act statement in the Federal Register published on April 11, 2000 (Volume 65, Number 70; Pages 19477-78) or you may visit http://www.regulations.gov

**Small Business Regulatory Enforcement Fairness Act**

The Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996 requires FAA to comply with small entity requests for information or advice about compliance with statutes and regulations within its jurisdiction. If you are a small entity and you have a question regarding this document, you may contact its local FAA official, or the person listed under the CONTACTS FOR FURTHER INFORMATION heading at the beginning of the preamble. You can find out more about SBREFA on the Internet at http://www.faa.gov/regulations_policies/rulemaking/sbre_act/.

**List of Subjects**

14 CFR Part 1

Air Transportation

14 CFR Part 21

Aircraft, Aviation safety, Exports, Imports, Reporting and recordkeeping

14 CFR Parts 25, 91, 125

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

14 CFT Part 26

Aircraft, Aviation safety, Continued airworthiness

14 CFR Parts 121, 129

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

## V. THE AMENDMENTS

In consideration of the foregoing, the Federal Aviation Administration amends Chapter I of Title 14, Code of Federal Regulations parts 1, 21, 25, 26, 91, 121, 125, and 129 as follows:

**PART 1—DEFINITIONS AND ABBREVIATIONS**

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

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

2. Amend § 1.2 to add the abbreviation "EWIS" in alphabetical order to read as follows:

§ 1.2 Abbreviations and symbols.

* * * * *

EWIS, as defined by § 25.1701 of this chapter, means electrical wiring interconnection system.

* * * * *

**PART 21—CERTIFICATION PROCEDURES FOR PRODUCTS AND PARTS**

3. The authority citation for part 21 continues to read as follows:

Authority: 42 U.S.C. 7572; 49 U.S.C. 106(g), 40105, 40113, 44701-44702, 44704, 44707, 44709, 44711, 44713, 44715, 45303.

**Subpart A—General**

4. Amend part 21 by adding a new § 21.7 to read as follows:

**§ 21.7 Continued airworthiness and safety improvements for transport category airplanes.**

(a) On or after December 10, 2007, the holder of a design approval and an applicant for a design approval must comply with the applicable continued airworthiness and safety improvement requirements of part 26 of this subchapter.

(b) For new transport category airplanes manufactured under the authority of the FAA, the holder or licensee of a type certificate must meet the applicable continued airworthiness and safety improvement requirements specified in part 26 of this subchapter for new production airplanes. Those requirements only apply if the FAA has jurisdiction over the organization responsible for final assembly of the airplane.

**Subpart B—Type Certification**

5. Amend § 21.17 by revising paragraph (a) introductory text to read as follows:

§ 21.17 Designation of applicable regulations.

(a) Except as provided in § 23.2, § 25.2, § 27.2, § 29.2, and in parts 26, 34 and 36 of this subchapter, an applicant for a type certificate must show that the aircraft, aircraft engine, or propeller concerned meets–

* * * * *

6. Amend § 21.31 by revising paragraph (c) to read as follows:

**§ 21.31 Type design.**

* * * * *

(c) The Airworthiness Limitations section of the Instructions for Continued Airworthiness as required by Parts 23, 25, 26, 27, 29, 31, 33 and 35 of this subchapter, or as otherwise required by the Administrator; and as specified in the applicable airworthiness criteria for special classes of aircraft defined in § 21.17(b); and

* * * * *

7. Amend § 21.50 by revising paragraph (b) to read as follows:

**§ 21.50 Instructions for continued airworthiness and manufacturer's maintenance manuals having airworthiness limitations sections.**

* * * * *

(b) The holder of a design approval, including either the type certificate or supplemental type certificate for an aircraft, aircraft engine, or propeller for which application was made after January 28, 1981, shall furnish at least one set of complete Instructions for Continued Airworthiness, to the owner of each type aircraft, aircraft engine, or propeller upon its delivery, or upon issuance of the first standard airworthiness certificate for the affected aircraft, whichever occurs later. The Instructions must be prepared in accordance with §§ 23.1529, 25.1529, 25.1729, 27.1529, 29.1529, 31.82, 33.4, 35.4, or part 26 of this subchapter, or as specified in the applicable airworthiness criteria for special classes of aircraft defined in § 21.17(b), as applicable. Thereafter, the holder of a design approval must make those instructions available to

any other person required by this chapter to comply with any of the terms of those instructions. In addition, changes to the Instructions for Continued Airworthiness shall be made available to any person required by this chapter to comply with any of those instructions.

**Subpart D—Changes to Type Certificates**

8. Amend § 21.101 by revising paragraph (b) introductory text and adding a new paragraph (g) to read as follows:

**§ 21.101 Designation of applicable regulations.**

* * * * *

(b) Except as provided in paragraph (g) of this section, if paragraphs (b)(1), (2), or (3) of this section apply, an applicant may show that the changed product complies with an earlier amendment of a regulation required by paragraph (a) of this section, and of any other regulation the Administrator finds is directly related. However, the earlier amended regulation may not precede either the corresponding regulation incorporated by reference in the type certificate, or any regulation in §§ 23.2, 25.2, 27.2, or 29.2 of this subchapter that is related to the change. The applicant may show compliance with an earlier amendment of a regulation for any of the following:

* * * * *

(g) Notwithstanding paragraph (b) of this section, for transport category airplanes, the applicant must show compliance with each applicable provision of part 26 of this chapter, unless the applicant has elected or was required to comply with a corresponding amendment to part 25 of this chapter that was issued on or after the date of the applicable part 26 provision.

**PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES**

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

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

10. Amend § 25.611 by re-designating the existing paragraph as paragraph (a) and adding new paragraph (b) to read as follows:

**§ 25.611 Accessibility provisions.**

(a) * * *

(b) EWIS must meet the accessibility requirements of § 25.1719.

11. Amend § 25.855 by revising paragraph (e) introductory text and adding new paragraph (j) as follows:

**§ 25.855 Cargo or baggage compartments.**

* * * * *

(e) No compartment may contain any controls, lines, equipment, or accessories whose damage or failure would affect safe operation, unless those items are protected so that—

* * * * *

(j) Cargo or baggage compartment electrical wiring interconnection system components must meet the requirements of § 25.1721.

12. Amend § 25.869 by removing paragraph (a)(4) and revising paragraphs (a)(2) and (a)(3) as follows:

**§ 25.869 Fire protection: systems.**

(a) * * *

(2) Equipment that is located in designated fire zones and is used during emergency procedures must be at least fire resistant.

(3) EWIS components must meet the requirements of § 25.1713.

* * * * *

13. Amend part 25 by adding a new § 25.899 to subpart D to read as follows:

**§ 25.899 Electrical bonding and protection against static electricity.**

(a) Electrical bonding and protection against static electricity must be designed to minimize accumulation of electrostatic charge that would cause –

(1) Human injury from electrical shock,

(2) Ignition of flammable vapors, or

(3) Interference with installed electrical/electronic equipment.

(b) Compliance with paragraph (a) of this section may be shown by –

(1) Bonding the components properly to the airframe; or

(2) Incorporating other acceptable means to dissipate the static charge so as not to endanger the airplane, personnel, or operation of the installed electrical/electronic systems.

14. Amend § 25.1203 by revising paragraph (e) and adding a new paragraph (h) as follows:

**§ 25.1203 Fire detector system.**

* * * * *

(e) Components of each fire or overheat detector system in a fire zone must be fire-resistant.

* * * * *

(h) EWIS for each fire or overheat detector system in a fire zone must meet the requirements of § 25.1731.

15. Amend § 25.1301 by designating the introductory text as paragraph (a), re-designating paragraphs (a) through (d) as (a)(1) through (4), and adding a new paragraph (b) as follows:

**§ 25.1301 Function and installation.**

*****

(b) EWIS must meet the requirements of subpart H of this part.

16. Amend § 25.1309 by removing paragraph (e) and re-designating paragraph (g) as paragraph (e), and revising paragraph (f) as follows:

**§ 25.1309 Equipment, systems, and installations.**

* * * * *

(f) EWIS must be assessed in accordance with the requirements of § 25.1709.

17. Amend part 25 by adding a new § 25.1310, to read as follows:

**§ 25.1310 Power source capacity and distribution.**

(a) Each installation whose functioning is required for type certification or under operating rules and that requires a power supply is an “essential load” on the power supply. The power sources and the system must be able to supply the following power loads in probable operating combinations and for probable durations:

(1) Loads connected to the system with the system functioning normally.

(2) Essential loads, after failure of any one prime mover, power converter, or energy storage device.

(3) Essential loads after failure of –

(i) Any one engine on two-engine airplanes; and

(ii) Any two engines on airplanes with three or more engines.

(4) Essential loads for which an alternate source of power is required, after any failure or malfunction in any one power supply system, distribution system, or other utilization system.

(b) In determining compliance with paragraphs (a)(2) and (3) of this section, the power loads may be assumed to be reduced under a monitoring procedure consistent with safety in the kinds of operation authorized. Loads not required in controlled flight need not be considered for the two-engine-inoperative condition on airplanes with three or more engines.

18. Revise § 25.1353 to read as follows:

**§ 25.1353 Electrical equipment and installations.**

(a) Electrical equipment and controls must be installed so that operation of any one unit or system of units will not adversely affect the simultaneous operation of any other electrical unit or system essential to safe operation. Any electrical interference likely to be present in the airplane must not result in hazardous effects on the airplane or its systems.

(b) Storage batteries must be designed and installed as follows:

(1) Safe cell temperatures and pressures must be maintained during any probable charging or discharging condition. No uncontrolled increase in cell temperature may result when the battery is recharged (after previous complete discharge)—

(i) At maximum regulated voltage or power;

(ii) During a flight of maximum duration; and

(iii) Under the most adverse cooling condition likely to occur in service.

(2) Compliance with paragraph (b)(1) of this section must be shown by test unless experience with similar batteries and installations has shown that maintaining safe cell temperatures and pressures presents no problem.

(3) No explosive or toxic gases emitted by any battery in normal operation, or as the result of any probable malfunction in the charging system or battery installation, may accumulate in hazardous quantities within the airplane.

(4) No corrosive fluids or gases that may escape from the battery may damage surrounding airplane structures or adjacent essential equipment.

(5) Each nickel cadmium battery installation must have provisions to prevent any hazardous effect on structure or essential systems that may be caused by the maximum amount of heat the battery can generate during a short circuit of the battery or of individual cells.

(6) Nickel cadmium battery installations must have—

(i) A system to control the charging rate of the battery automatically so as to prevent battery overheating;

(ii) A battery temperature sensing and over-temperature warning system with a means for disconnecting the battery from its charging source in the event of an over-temperature condition; or

(iii) A battery failure sensing and warning system with a means for disconnecting the battery from its charging source in the event of battery failure.

(c) Electrical bonding must provide an adequate electrical return path under both normal and fault conditions, on airplanes having grounded electrical systems.

19. Amend § 25.1357 by revising paragraphs (d) and (f) to read as follows:

**§ 25.1357 Circuit protective devices.**

* * * * *

(d) If the ability to reset a circuit breaker or replace a fuse is essential to safety in flight, that circuit breaker or fuse must be located and identified so that it can be readily reset or replaced in flight. Where fuses are used, there must be spare fuses for use in flight equal to at least 50% of the number of fuses of each rating required for complete circuit protection.

* * * * *

(f) For airplane systems for which the ability to remove or reset power during normal operations is necessary, the system must be designed so that circuit breakers are not the primary means to remove or reset system power unless specifically designed for use as a switch.

* * * * *

20. Amend part 25 by adding a new § 25.1360 to read as follows:

**§ 25.1360 Precautions against injury.**

(a) Shock. The electrical system must be designed to minimize risk of electric shock to crew, passengers, and servicing personnel and to maintenance personnel using normal precautions.

(b) Burns. The temperature of any part that may be handled by a crewmember during normal operations must not cause dangerous inadvertent movement by the crewmember or injury to the crewmember.

21. Amend part 25 by adding a new § 25.1362 to read as follows:

**§ 25.1362 Electrical supplies for emergency conditions.**

A suitable electrical supply must be provided to those services required for emergency procedures after an emergency landing or ditching. The circuits for these services must be designed, protected, and installed so that the risk of the services being rendered ineffective under these emergency conditions is minimized.

22. Amend part 25 by adding a new § 25.1365 to read as follows:

**§ 25.1365 Electrical appliances, motors, and transformers**.

(a) Domestic appliances must be designed and installed so that in the event of failures of the electrical supply or control system, the requirements of § 25.1309(b), (c), and (d) will be satisfied. Domestic appliances are items such as cooktops, ovens, coffee makers, water heaters, refrigerators, and toilet flush systems that are placed on the airplane to provide service amenities to passengers.

(b) Galleys and cooking appliances must be installed in a way that minimizes risk of overheat or fire.

(c) Domestic appliances, particularly those in galley areas, must be installed or protected so as to prevent damage or contamination of other equipment or systems from fluids or vapors which may be present during normal operation or as a result of spillage, if such damage or contamination could create a hazardous condition.

(d) Unless compliance with § 25.1309(b) is provided by the circuit protective device required by § 25.1357(a), electric motors and transformers, including those installed in domestic systems, must have a suitable thermal protection device to prevent overheating under normal operation and failure conditions, if overheating could create a smoke or fire hazard.

23. Amend part 25 by adding new subpart H to read as follows:

**Subpart H—Electrical Wiring Interconnection Systems (EWIS)**

Sec.

25.1701 Definition.

25.1703 Function and installation: EWIS.

25.1705 Systems and functions: EWIS.

25.1707 System separation: EWIS.

25.1709 System safety: EWIS.

25.1711 Component identification: EWIS.

25.1713 Fire protection: EWIS.

25.1715 Electrical bonding and protection against static electricity: EWIS.

25.1717 Circuit protective devices: EWIS.

25.1719 Accessibility provisions: EWIS.

25.1721 Protection of EWIS.

25.1723 Flammable fluid fire protection: EWIS.

25.1725 Powerplants: EWIS.

25.1727 Flammable fluid shutoff means: EWIS.

25.1729 Instructions for Continued Airworthiness: EWIS.

25.1731 Powerplant and APU fire detector system: EWIS.

25.1733 Fire detector systems, general: EWIS.

**Subpart H—Electrical Wiring Interconnection Systems (EWIS)**

**§ 25.1701 Definition.**

(a) As used in this chapter, electrical wiring interconnection system (EWIS) means any wire, wiring device, or combination of these, including termination devices, installed in any area of the airplane for the purpose of transmitting electrical energy, including data and signals, between two or more intended termination points. This includes:

(1) Wires and cables.

(2) Bus bars.

(3) The termination point on electrical devices, including those on relays, interrupters, switches, contactors, terminal blocks and circuit breakers, and other circuit protection devices.

(4) Connectors, including feed-through connectors.

(5) Connector accessories.

(6) Electrical grounding and bonding devices and their associated connections.

(7) Electrical splices.

(8) Materials used to provide additional protection for wires, including wire insulation, wire sleeving, and conduits that have electrical termination for the purpose of bonding.

(9) Shields or braids.

(10) Clamps and other devices used to route and support the wire bundle.

(11) Cable tie devices.

(12) Labels or other means of identification.

(13) Pressure seals.

(14) EWIS components inside shelves, panels, racks, junction boxes, distribution panels, and back-planes of equipment racks, including, but not limited to, circuit board back-planes, wire integration units, and external wiring of equipment.

(b) Except for the equipment indicated in paragraph (a)(14) of this section, EWIS components inside the following equipment, and the external connectors that are part of that equipment, are excluded from the definition in paragraph (a) of this section:

(1) Electrical equipment or avionics that are qualified to environmental conditions and testing procedures when those conditions and procedures are—

(i) Appropriate for the intended function and operating environment, and

(ii) Acceptable to the FAA.

(2) Portable electrical devices that are not part of the type design of the airplane. This includes personal entertainment devices and laptop computers.

(3) Fiber optics.

**§ 25.1703 Function and installation: EWIS.**

(a) Each EWIS component installed in any area of the aircraft must:

(1) Be of a kind and design appropriate to its intended function.

(2) Be installed according to limitations specified for the EWIS components.

(3) Perform the function for which it was intended without degrading the airworthiness of the airplane.

(4) Be designed and installed in a way that will minimize mechanical strain.

(b) Selection of wires must take into account known characteristics of the wire in relation to each installation and application to minimize the risk of wire damage, including any arc tracking phenomena.

(c) The design and installation of the main power cables (including generator cables) in the fuselage must allow for a reasonable degree of deformation and stretching without failure.

(d) EWIS components located in areas of known moisture accumulation must be protected to minimize any hazardous effects due to moisture.

**§ 25.1705 Systems and functions: EWIS.**

(a) EWIS associated with any system required for type certification or by operating rules must be considered an integral part of that system and must be considered in showing compliance with the applicable requirements for that system.

(b) For systems to which the following rules apply, the components of EWIS associated with those systems must be considered an integral part of that system or systems and must be considered in showing compliance with the applicable requirements for that system.

(1) § 25.773(b)(2) Pilot compartment view.

(2) § 25.981 Fuel tank ignition prevention.

(3) § 25.1165 Engine ignition systems.

(4) § 25.1310 Power source capacity and distribution.

(5) § 25.1316 System lightning protection.

(6) § 25.1331(a)(2) Instruments using a power supply.

(7) § 25.1351 General.

(8) § 25.1355 Distribution system.

(9) § 25.1360 Precautions against injury.

(10) § 25.1362 Electrical supplies for emergency conditions.

(11) § 25.1365 Electrical appliances, motors, and transformers.

(12) § 25.1431(c) and (d) Electronic equipment.

**§ 25.1707 System separation: EWIS.**

(a) Each EWIS must be designed and installed with adequate physical separation from other EWIS and airplane systems so that an EWIS component failure will not create a hazardous condition. Unless otherwise stated, for the purposes of this section, adequate physical separation

must be achieved by separation distance or by a barrier that provides protection equivalent to that separation distance.

(b) Each EWIS must be designed and installed so that any electrical interference likely to be present in the airplane will not result in hazardous effects upon the airplane or its systems.

(c) Wires and cables carrying heavy current, and their associated EWIS components, must be designed and installed to ensure adequate physical separation and electrical isolation so that damage to circuits associated with essential functions will be minimized under fault conditions.

(d) Each EWIS associated with independent airplane power sources or power sources connected in combination must be designed and installed to ensure adequate physical separation and electrical isolation so that a fault in any one airplane power source EWIS will not adversely affect any other independent power sources. In addition:

(1) Airplane independent electrical power sources must not share a common ground terminating location.

(2) Airplane system static grounds must not share a common ground terminating location with any of the airplane's independent electrical power sources.

(e) Except to the extent necessary to provide electrical connection to the fuel systems components, the EWIS must be designed and installed with adequate physical separation from fuel lines and other fuel system components, so that:

(1) An EWIS component failure will not create a hazardous condition.

(2) Any fuel leakage onto EWIS components will not create a hazardous condition.

(f) Except to the extent necessary to provide electrical connection to the hydraulic systems components, EWIS must be designed and installed with adequate physical separation from hydraulic lines and other hydraulic system components, so that:

(1) An EWIS component failure will not create a hazardous condition.

(2) Any hydraulic fluid leakage onto EWIS components will not create a hazardous condition.

(g) Except to the extent necessary to provide electrical connection to the oxygen systems components, EWIS must be designed and installed with adequate physical separation from oxygen lines and other oxygen system components, so that an EWIS component failure will not create a hazardous condition.

(h) Except to the extent necessary to provide electrical connection to the water/waste systems components, EWIS must be designed and installed with adequate physical separation from water/waste lines and other water/waste system components, so that:

(1) An EWIS component failure will not create a hazardous condition.

(2) Any water/waste leakage onto EWIS components will not create a hazardous condition.

(i) EWIS must be designed and installed with adequate physical separation between the EWIS and flight or other mechanical control systems cables and associated system components, so that:

(1) Chafing, jamming, or other interference are prevented.

(2) An EWIS component failure will not create a hazardous condition.

(3) Failure of any flight or other mechanical control systems cables or systems components will not damage the EWIS and create a hazardous condition.

(j) EWIS must be designed and installed with adequate physical separation between the EWIS components and heated equipment, hot air ducts, and lines, so that:

(1) An EWIS component failure will not create a hazardous condition.

(2) Any hot air leakage or heat generated onto EWIS components will not create a hazardous condition.

(k) For systems for which redundancy is required, by certification rules, by operating rules, or as a result of the assessment required by § 25.1709, EWIS components associated with those systems must be designed and installed with adequate physical separation.

(l) Each EWIS must be designed and installed so there is adequate physical separation between it and other aircraft components and aircraft structure, and so that the EWIS is protected

from sharp edges and corners, to minimize potential for abrasion/chafing, vibration damage, and other types of mechanical damage.

**§ 25.1709 System safety: EWIS.**

Each EWIS must be designed and installed so that:

(a) Each catastrophic failure condition –

(1) is extremely improbable; and

(2) does not result from a single failure.

(b) Each hazardous failure condition is extremely remote.

**§ 25.1711 Component identification: EWIS.**

(a) EWIS components must be labeled or otherwise identified using a consistent method that facilitates identification of the EWIS component, its function, and its design limitations, if any.

(b) For systems for which redundancy is required, by certification rules, by operating rules, or as a result of the assessment required by § 25.1709, EWIS components associated with those systems must be specifically identified with component part number, function, and separation requirement for bundles.

(1) The identification must be placed along the wire, cable, or wire bundle at appropriate intervals and in areas of the airplane where it is readily visible to maintenance, repair, or alteration personnel.

(2) If an EWIS component cannot be marked physically, then other means of identification must be provided.

(c) The identifying markings required by paragraphs (a) and (b) of this section must remain legible throughout the expected service life of the EWIS component.

(d) The means used for identifying each EWIS component as required by this section must not have an adverse effect on the performance of that component throughout its expected service life.

(e) Identification for EWIS modifications to the type design must be consistent with the identification scheme of the original type design.

**§ 25.1713 Fire protection: EWIS.**

(a) All EWIS components must meet the applicable fire and smoke protection requirements of § 25.831(c) of this part.

(b) EWIS components that are located in designated fire zones and are used during emergency procedures must be fire resistant.

(c) Insulation on electrical wire and electrical cable, and materials used to provide additional protection for the wire and cable, installed in any area of the airplane, must be self-extinguishing when tested in accordance with the applicable portions of Appendix F, part I, of 14 CFR part 25.

**§ 25.1715 Electrical bonding and protection against static electricity: EWIS.**

(a) EWIS components used for electrical bonding and protection against static electricity must meet the requirements of § 25.899.

(b) On airplanes having grounded electrical systems, electrical bonding provided by EWIS components must provide an electrical return path capable of carrying both normal and fault currents without creating a shock hazard or damage to the EWIS components, other airplane system components, or airplane structure.

**§ 25.1717 Circuit protective devices: EWIS.**

Electrical wires and cables must be designed and installed so they are compatible with the circuit protection devices required by § 25.1357, so that a fire or smoke hazard cannot be created under temporary or continuous fault conditions.

**§ 25.1719 Accessibility provisions: EWIS.**

Access must be provided to allow inspection and replacement of any EWIS component as necessary for continued airworthiness.

**§ 25.1721 Protection of EWIS.**

(a) No cargo or baggage compartment may contain any EWIS whose damage or failure may affect safe operation, unless the EWIS is protected so that:

(1) It cannot be damaged by movement of cargo or baggage in the compartment.

(2) Its breakage or failure will not create a fire hazard.

(b) EWIS must be designed and installed to minimize damage and risk of damage to EWIS by movement of people in the airplane during all phases of flight, maintenance, and servicing.

(c) EWIS must be designed and installed to minimize damage and risk of damage to EWIS by items carried onto the aircraft by passengers or cabin crew.

**§ 25.1723 Flammable fluid fire protection: EWIS.**

EWIS components located in each area where flammable fluid or vapors might escape by leakage of a fluid system must be considered a potential ignition source and must meet the requirements of § 25.863.

**§ 25.1725 Powerplants: EWIS.**

(a) EWIS associated with any powerplant must be designed and installed so that the failure of an EWIS component will not prevent the continued safe operation of the remaining powerplants or require immediate action by any crewmember for continued safe operation, in accordance with the requirements of § 25.903(b).

(b) Design precautions must be taken to minimize hazards to the airplane due to EWIS damage in the event of a powerplant rotor failure or a fire originating within the powerplant that burns through the powerplant case, in accordance with the requirements of § 25.903(d)(1).

**§ 25.1727 Flammable fluid shutoff means: EWIS.**

EWIS associated with each flammable fluid shutoff means and control must be fireproof or must be located and protected so that any fire in a fire zone will not affect operation of the flammable fluid shutoff means, in accordance with the requirements of § 25.1189.

**§ 25.1729 Instructions for Continued Airworthiness: EWIS.**

The applicant must prepare Instructions for Continued Airworthiness applicable to EWIS in accordance with Appendix H sections H25.4 and H25.5 to this part that are approved by the FAA.

**§ 25.1731 Powerplant and APU fire detector system: EWIS.**

(a) EWIS that are part of each fire or overheat detector system in a fire zone must be fire-resistant.

(b) No EWIS component of any fire or overheat detector system for any fire zone may pass through another fire zone, unless:

(1) It is protected against the possibility of false warnings resulting from fires in zones through which it passes; or

(2) Each zone involved is simultaneously protected by the same detector and extinguishing system.

(c) EWIS that are part of each fire or overheat detector system in a fire zone must meet the requirements of § 25.1203.

**§ 25.1733 Fire detector systems, general: EWIS.**

EWIS associated with any installed fire protection system, including those required by §§ 25.854 and 25.858, must be considered an integral part of the system in showing compliance with the applicable requirements for that system.

24. Amend H25.1 of Appendix H to part 25 by revising paragraph (a) to read as follows:

**APPENDIX H TO PART 25—INSTRUCTIONS FOR CONTINUED AIRWORTHINESS**

H25.1 *General.*

(a) This appendix specifies requirements for preparation of Instructions for Continued Airworthiness as required by §§ 25.1529, 25.1729, and applicable provisions of parts 21 and 26 of this chapter.

* * * * *

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

**APPENDIX H TO PART 25—INSTRUCTIONS FOR CONTINUED AIRWORTHINESS**

* * * * *

H25.4 *Airworthiness Limitations section.*

(a) * * *

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

* * * * *

(3) Any mandatory replacement time of EWIS components as defined in section 25.1701.

* * * * *

26. Amend Appendix H to part 25 by adding new paragraph H25.5 to read as follows:

**APPENDIX H TO PART 25—INSTRUCTIONS FOR CONTINUED AIRWORTHINESS**

* * * * *

H25.5 *Electrical Wiring Interconnection System (EWIS) Instructions for Continued Airworthiness.*

(a) The applicant must prepare Instructions for Continued Airworthiness (ICA) applicable to EWIS as defined by § 25.1701 that are approved by the FAA and include the following:

(1) Maintenance and inspection requirements for the EWIS developed with the use of an enhanced zonal analysis procedure that includes:

(i) Identification of each zone of the airplane.

(ii) Identification of each zone that contains EWIS.

(iii) Identification of each zone containing EWIS that also contains combustible materials.

(iv) Identification of each zone in which EWIS is in close proximity to both primary and back-up hydraulic, mechanical, or electrical flight controls and lines.

(v) Identification of –

(A) Tasks, and the intervals for performing those tasks, that will reduce the likelihood of ignition sources and accumulation of combustible material, and

(B) Procedures, and the intervals for performing those procedures, that will effectively clean the EWIS components of combustible material if there is not an effective task to reduce the likelihood of combustible material accumulation.

(vi) Instructions for protections and caution information that will minimize contamination and accidental damage to EWIS, as applicable, during performance of maintenance, alteration, or repairs.

(2) Acceptable EWIS maintenance practices in a standard format.

(3) Wire separation requirements as determined under § 25.1707.

(4) Information explaining the EWIS identification method and requirements for identifying any changes to EWIS under § 25.1711.

(5) Electrical load data and instructions for updating that data.

(b) The EWIS ICA developed in accordance with the requirements of H25.5(a)(1) must be in the form of a document appropriate for the information to be provided, and they must be easily recognizable as EWIS ICA. This document must either contain the required EWIS ICA or specifically reference other portions of the ICA that contain this information.

27. Amend 14 CFR by adding new part 26 to read as follows:

**Part 26—CONTINUED AIRWORTHINESS AND SAFETY IMPROVEMENTS FOR TRANSPORT CATEGORY AIRPLANES**

Subpart A—General

Sec.

26.1 Purpose and scope.

26.3 Definitions.

26.5 Applicability table.

Subpart B–Enhanced Airworthiness Program for Aging Systems

§ 26.11 Electrical wiring interconnection systems (EWIS) maintenance program.

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

**Subpart A—General**

**§ 26.1 Purpose and scope.**

(a) This part establishes requirements for support of the continued airworthiness of and safety improvements for transport category airplanes. These requirements may include performing assessments, developing design changes, developing revisions to Instructions for Continued Airworthiness (ICA), and making necessary documentation available to affected persons. Requirements of this part that establish standards for design changes and revisions to the ICA are considered airworthiness requirements.

(b) Except as provided in paragraph (c) of this section, this part applies to the following persons, as specified in each subpart of this part:

(1) Holders of type certificates and supplemental type certificates.

(2) Applicants for type certificates and supplemental type certificates and changes to those certificates (including service bulletins describing design changes).

(3) Persons seeking design approval for airplane repairs, alterations, or modifications that may affect airworthiness.

(4) Holders of type certificates and their licensees producing new airplanes.

(c) An applicant for approval of a design change is not required to comply with any applicable airworthiness requirement of this part if the applicant elects or is required to comply with a corresponding amendment to part 25 of this chapter that is adopted concurrently or after that airworthiness requirement.

(d) For the purposes of this part, the word “type certificate” does not include supplemental type certificates.

**§ 26.3 Definitions.**

For the purposes of this part:

FAA Oversight Office is the aircraft certification office or office of the Transport Airplane Directorate with oversight responsibility for the relevant type certificate, supplemental type certificate, or manufacturer, as determined by the Administrator.

**§ 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)** |
| **Effective Date of Rule** | TBD |
| **Existing[1] TC Holders** | 26.11 |
| **Pending[1] TC Applicants** | 26.11 |
| **Existing[1] STC Holders** | N/A |
| **Pending[1] STC/ATC Applicants** | 26.11 |
| **Future[2] STC/ATC Applicants** | 26.11 |
| **Manufacturers** | N/A |

| | |
|---|---|
| **Persons Seeking Design Approval of Repairs** | N/A |

[1] As of the effective date of the identified rule.

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

**Subpart B—Enhanced Airworthiness Program for Aging Systems**

**§ 26.11 Electrical wiring interconnection systems (EWIS) maintenance program**

(a) Except as provided in paragraph (g) of this section, this section applies to transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958, that, as a result of the original certification, or later increase in capacity, have -

(1) A maximum type-certificated passenger capacity of 30 or more or

(2) A maximum payload capacity of 7,500 pounds or more.

(b) Holders of, and applicants for, type certificates, as identified in paragraph (d) of this section must develop Instructions for Continued Airworthiness (ICA) for the representative airplane's EWIS in accordance with part 25, Appendix H paragraphs H25.5(a)(1) and (b) of this subchapter in effect on December 10, 2007 for each affected type design, and submit those ICA for review and approval by the FAA Oversight Office. For purposes of this section, the "representative airplane" is the configuration of each model series airplane that incorporates all variations of EWIS used in production on that series airplane, and all TC-holder-designed modifications mandated by airworthiness directive as of the effective date of this rule. Each person specified in paragraph (d) of this section must also review any fuel tank system ICA developed by that person to comply with SFAR 88 to ensure compatibility with the EWIS ICA, including minimizing redundant requirements.

(c) Applicants for amendments to type certificates and supplemental type certificates, as identified in paragraph (d) of this section, must:

(1) Evaluate whether the design change for which approval is sought necessitates a revision to the ICA required by paragraph (b) of this section to comply with the requirements of Appendix H, paragraphs H25.5(a)(1) and (b). If so, the applicant must develop and submit the necessary revisions for review and approval by the FAA Oversight Office.

(2) Ensure that any revised EWIS ICA remain compatible with any fuel tank system ICA previously developed to comply with SFAR 88 and any redundant requirements between them are minimized.

(d) The following persons must comply with the requirements of paragraph (b) or (c) of this section, as applicable, before the dates specified.

(1) Holders of type certificates (TC): December 10, 2009.

(2) Applicants for TCs, and amendments to TCs (including service bulletins describing design changes), if the date of application was before December 10, 2007 and the certificate was issued on or after December 10, 2007: December 10, 2009, or the date the certificate is issued, whichever occurs later.

(3) Unless compliance with § 25.1729 of this subchapter is required or elected, applicants for amendments to TCs, if the application was filed on or after December 10, 2007: December 10, 2009, or the date of approval of the certificate, whichever occurs later.

(4) Applicants for supplemental type certificates (STC), including changes to existing STCs, if the date of application was before December 10, 2007 and the certificate was issued on or after December 10, 2007: June 7, 2010, or the date of approval of the certificate, whichever occurs later.

(5) Unless compliance with § 25.1729 of this subchapter is required or elected, applicants for STCs, including changes to existing STCs, if the application was filed on or after December 10, 2007, June 7, 2010, or the date of approval of the certificate, whichever occurs later.

(e) Each person identified in paragraphs (d)(1), (d)(2), and (d)(4) of this section must submit to the FAA Oversight Office for approval a compliance plan by March 10, 2008. The compliance plan must include the following information:

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

(2) A proposed means of compliance with this section, identifying all required submissions, including all compliance items as mandated in part 25, Appendix H paragraphs H25.5(a)(1) and (b) of this subchapter in effect on December 10, 2007, and all data to be developed to substantiate compliance.

(3) A proposal for submitting a draft of all compliance items required by paragraph (e)(2) of this section for review by the FAA Oversight Office not less than 60 days before the compliance time specified in paragraph (d) of this section.

(4) A proposal for how the approved ICA will be made available to affected persons.

(f) Each person specified in paragraph (e) must implement the compliance plan, or later approved revisions, as approved in compliance with paragraph (e) of this section.

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

(1) Lockheed L-188

(2) Bombardier CL-44

(3) Mitsubishi YS-11

(4) British Aerospace BAC 1-11

(5) Concorde

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

(7) VFW-Vereinigte Flugtechnische Werk VFW-614

(8) Illyushin Aviation IL 96T

(9) Bristol Aircraft Britannia 305

(10) Handley Page Herald Type 300

(11) Avions Marcel Dassault - Breguet Aviation Mercure 100C

(12) Airbus Caravelle

(13) Lockheed L-300

**PART 91—GENERAL OPERATING AND FLIGHT RULES**

28. The authority citation for part 91 continues to read as follows:

Authority: 49 U.S.C. 106(g), 1155, 40103, 40113, 40120, 44101, 44111, 44701, 44709, 44711, 44712, 44715, 44716, 44717, 44722, 46306, 46315, 46316, 46504, 46506–46507, 47122, 47508, 47528–47531, articles 12 and 29 of the Convention on International Civil Aviation (61 stat. 1180).

29. Amend § 91.1 by adding a new paragraph (d) to read as follows:

**§ 91.1 Applicability.**

* * * * *

(d) This part also establishes requirements for operators to take actions to support the continued airworthiness of each airplane.

30. Amend part 91 by adding new Subpart L as follows:

**Subpart L—Continued Airworthiness and Safety Improvements**

Sec.

91.1501 Purpose and definition.

91.1503 [Reserved]

91.1505 [Reserved]

91.1507 Fuel tank system inspection program.

**Subpart L—Continued Airworthiness and Safety Improvements**

**§ 91.1501 Purpose and definition.**

(a) This subpart requires operators to support the continued airworthiness of each airplane. These requirements may include, but are not limited to, revising the inspection program, incorporating design changes, and incorporating revisions to Instructions for Continued Airworthiness.

(b) For purposes of this subpart, the "FAA Oversight Office" is the aircraft certification office or office of the Transport Airplane Directorate with oversight responsibility for the relevant type certificate or supplemental type certificate, as determined by the Administrator.

**§ 91.1503 [Reserved]**

**§ 91.1505 [Reserved]**

**§ 91.1507 Fuel tank system inspection program.**

(a) Except as provided in paragraph (g) of this section, this section applies to transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958, that, as a result of original type certification or later increase in capacity, have –

(1) A maximum type-certificated passenger capacity of 30 or more, or

(2) A maximum payload capacity of 7,500 pounds or more.

(b) For each airplane on which an auxiliary fuel tank is installed under a field approval, before June 16, 2008, the operator must submit to the FAA Oversight Office proposed maintenance instructions for the tank that meet the requirements of Special Federal Aviation Regulation No. 88 (SFAR 88) of this chapter.

(c) After December 16, 2008, no operator may operate an airplane identified in paragraph (a) of this section unless the inspection program for that airplane has been revised to include applicable inspections, procedures, and limitations for fuel tank systems.

(d) The proposed fuel tank system inspection program revisions specified in paragraph (c) of this section must be based on fuel tank system Instructions for Continued Airworthiness (ICA) that have been developed in accordance with the applicable provisions of SFAR 88 of this chapter or § 25.1529 and part 25, Appendix H, of this chapter, in effect on June 6, 2001 (including those developed for auxiliary fuel tanks, if any, installed under supplemental type certificates or other design approval) and that have been approved by the FAA Oversight Office.

(e) After December 16, 2008, before returning an airplane to service after any alterations for which fuel tank ICA are developed under SFAR 88, or under § 25.1529 in effect on June 6,

2001, the operator must include in the inspection program for the airplane inspections and procedures for the fuel tank system based on those ICA.

(f) The fuel tank system inspection program changes identified in paragraphs (d) and (e) of this section and any later fuel tank system revisions must be submitted to the Flight Standards District Office (FSDO) responsible for review and approval.

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

(1) Bombardier CL-44

(2) Concorde

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

(4) VFW-Vereinigte Flugtechnische Werk VFW-614

(5) Illyushin Aviation IL 96T

(6) Bristol Aircraft Britannia 305

(7) Handley Page Herald Type 300

(8) Avions Marcel Dassault - Breguet Aviation Mercure 100C

(9) Airbus Caravelle

(10) Lockheed L-300

31. Re-designate the text of § 91.410 as new § 91.1505, remove and reserve paragraph (b), and revise the section heading of newly re-designated § 91.1505 to read as follows:

**§ 91.1505 Repairs assessment for pressurized fuselages.**

* * * * *

**§ 91.410 [Reserved]**

32. Add and reserve a new § 91.410.

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

33. 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.

34. Amend § 121.1 by adding a new paragraph (g) to read as follows:

**§ 121.1 Applicability**

* * * * *

(g) This part also establishes requirements for operators to take actions to support the continued airworthiness of each airplane.

35. Amend part 121 by adding new subpart AA to read as follows:

**Subpart AA—Continued Airworthiness and Safety Improvements**

Sec.

121.1101 Purpose and definition.

121.1103 [Reserved]

121.1105 [Reserved]

121.1107 [Reserved]

121.1109 [Reserved]

121.1111 Electrical wiring interconnection systems (EWIS) maintenance program.

121.1113 Fuel tank system maintenance program.

**Subpart AA—Continued Airworthiness and Safety Improvements**

**§ 121.1101 Purpose and definition.**

(a) This subpart requires persons holding an air carrier or operating certificate under part 119 of this chapter to support the continued airworthiness of each airplane. These requirements may include, but are not limited to, revising the maintenance program, incorporating design changes, and incorporating revisions to Instructions for Continued Airworthiness.

(b) For purposes of this subpart, the "FAA Oversight Office" is the aircraft certification office or office of the Transport Airplane Directorate with oversight responsibility for the relevant type certificate or supplemental type certificate, as determined by the Administrator.

§ 121.1103 [Reserved]

§ 121.1105 [Reserved]

§ 121.1107 [Reserved]

§ 121.1109 [Reserved]

**§ 121.1111 Electrical wiring interconnection systems (EWIS) maintenance program.**

(a) Except as provided in paragraph (f) of this section, this section applies to transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958, that, as a result of original type certification or later increase in capacity, have –

(1) A maximum type-certificated passenger capacity of 30 or more, or

(2) A maximum payload capacity of 7500 pounds or more.

(b) After March 10, 2011, no certificate holder may operate an airplane identified in paragraph (a) of this section unless the maintenance program for that airplane includes inspections and procedures for electrical wiring interconnection systems (EWIS).

(c) The proposed EWIS maintenance program changes must be based on EWIS Instructions for Continued Airworthiness (ICA) that have been developed in accordance with the provisions of Appendix H of part 25 of this chapter applicable to each affected airplane (including those ICA developed for supplemental type certificates installed on each airplane) and that have been approved by the FAA Oversight Office.

(1) For airplanes subject to § 26.11 of this chapter, the EWIS ICA must comply with paragraphs H25.5(a)(1) and (b).

(2) For airplanes subject to § 25.1729 of this chapter, the EWIS ICA must comply with paragraph H25.4 and all of paragraph H25.5.

(d) After March 10, 2011, before returning an airplane to service after any alterations for which EWIS ICA are developed, the certificate holder must include in the airplane's maintenance program inspections and procedures for EWIS based on those ICA.

(e) The EWIS maintenance program changes identified in paragraphs (c) and (d) of this section and any later EWIS revisions must be submitted to the Principal Inspector for review and approval.

(f) This section does not apply to the following airplane models:

(1) Lockheed L-188

(2) Bombardier CL-44

(3) Mitsubishi YS-11

(4) British Aerospace BAC 1-11

(5) Concorde

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

(7) VFW-Vereinigte Flugtechnische Werk VFW-614

(8) Illyushin Aviation IL 96T

(9) Bristol Aircraft Britannia 305

(10) Handley Page Herald Type 300

(11) Avions Marcel Dassault - Breguet Aviation Mercure 100C

(12) Airbus Caravelle

(13) Lockheed L-300

**§ 121.1113 Fuel tank system maintenance program.**

(a) Except as provided in paragraph (g) of this section, this section applies to transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958, that, as a result of original type certification or later increase in capacity, have –

(1) A maximum type-certificated passenger capacity of 30 or more, or

(2) A maximum payload capacity of 7500 pounds or more.

(b) For each airplane on which an auxiliary fuel tank is installed under a field approval, before June 16, 2008, the certificate holder must submit to the FAA Oversight Office proposed maintenance instructions for the tank that meet the requirements of Special Federal Aviation Regulation No. 88 (SFAR 88) of this chapter.

(c) After December 16, 2008, no certificate holder may operate an airplane identified in paragraph (a) of this section unless the maintenance program for that airplane has been revised to include applicable inspections, procedures, and limitations for fuel tanks systems.

(d) The proposed fuel tank system maintenance program revisions must be based on fuel tank system Instructions for Continued Airworthiness (ICA) that have been developed in

accordance with the applicable provisions of SFAR 88 of this chapter or § 25.1529 and part 25, Appendix H, of this chapter, in effect on June 6, 2001 (including those developed for auxiliary fuel tanks, if any, installed under supplemental type certificates or other design approval) and that have been approved by the FAA Oversight Office.

(e) After December 16, 2008, before returning an aircraft to service after any alteration for which fuel tank ICA are developed under SFAR 88 or under § 25.1529 in effect on June 6, 2001, the certificate holder must include in the maintenance program for the airplane inspections and procedures for the fuel tank system based on those ICA.

(f) The fuel tank system maintenance program changes identified in paragraphs (d) and (e) of this section and any later fuel tank system revisions must be submitted to the Principal Inspector for review and approval.

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

(1) Bombardier CL-44

(2) Concorde

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

(4) VFW-Vereinigte Flugtechnische Werk VFW-614

(5) Illyushin Aviation IL 96T

(6) Bristol Aircraft Britannia 305

(7) Handley Page Herald Type 300

(8) Avions Marcel Dassault - Breguet Aviation Mercure 100C

(9) Airbus Caravelle

(10) Lockheed L-300

**§ 121.368 [Re-designated as § 121.1105]**

36. Re-designate § 121.368 as new § 121.1105.

**§ 121.368 [Reserved]**

37. Add and reserve a new § 121.368.

38. Re-designate § 121.370 as new § 121.1107, remove and reserve paragraph (b), and revise the section heading to read as follows:

**§ 121.1107 Repairs assessment for pressurized fuselages.**

* * * * *

**§ 121.370 [Reserved]**

39. Add and reserve a new § 121.370.

**§ 121.370a [Re-designated as § 121.1109]**

40. Re-designate § 121.370a as new § 121.1109.

**§ 121.370a [Reserved]**

41. Add and reserve a new § 121.370a.

**Part 125—CERTIFICATION AND OPERATIONS: AIRPLANES HAVING A SEATING CAPACITY OF 20 OR MORE PASSENGERS OR A MAXIMUM PAYLOAD CAPACITY OF 6,000 POUNDS OR MORE; AND RULES GOVERNING PERSONS ON BOARD SUCH AIRCRAFT**

42. The authority citation for part 125 continues to read as follows:

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

43. Amend § 125.1 by adding a new paragraph (e) to read as follows:

**§ 125.1 Applicability.**

* * * * *

(e) This part also establishes requirements for operators to take actions to support the continued airworthiness of each airplane.

44. Amend part 125 by adding new subpart M to read as follows:

Subpart M—Continued Airworthiness and Safety Improvements

Sec.

125.501 Purpose and definition.

125.503 [Reserved]

125.505 [Reserved]

125.507 Fuel tank system inspection program.

**Subpart M—Continued Airworthiness and Safety Improvements**

**§ 125.501 Purpose and definition.**

(a) This subpart requires operators to support the continued airworthiness of each airplane. These requirements may include, but are not limited to, revising the inspection program, incorporating design changes, and incorporating revisions to Instructions for Continued Airworthiness.

(b) For purposes of this subpart, the "FAA Oversight Office" is the aircraft certification office or office of the Transport Airplane Directorate with oversight responsibility for the relevant type certificate or supplemental type certificate, as determined by the Administrator.

**§ 125.503 [Reserved]**

**§ 125.505 [Reserved]**

**§ 125.507 Fuel tank system inspection program.**

(a) Except as provided in paragraph (g) of this section, this section applies to transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958, that, as a result of original type certification or later increase in capacity, have –

(1) A maximum type-certificated passenger capacity of 30 or more, or

(2) A maximum payload capacity of 7500 pounds or more.

(b) For each airplane on which an auxiliary fuel tank is installed under a field approval, before June 16, 2008, the certificate holder must submit to the FAA Oversight Office proposed maintenance instructions for the tank that meet the requirements of Special Federal Aviation Regulation No. 88 (SFAR 88) of this chapter.

(c) After December 16, 2008, no certificate holder may operate an airplane identified in paragraph (a) of this section unless the inspection program for that airplane has been revised to include applicable inspections, procedures, and limitations for fuel tank systems.

(d) The proposed fuel tank system inspection program revisions must be based on fuel tank system Instructions for Continued Airworthiness (ICA) that have been developed in accordance with the applicable provisions of SFAR 88 of this chapter or § 25.1529 and part 25, Appendix H, of this chapter, in effect on June 6, 2001 (including those developed for auxiliary fuel tanks, if any, installed under supplemental type certificates or other design approval) and that have been approved by the FAA Oversight Office.

(e) After December 16, 2008, before returning an aircraft to service after any alteration for which fuel tank ICA are developed under SFAR 88, or under § 25.1529 in effect on June 6, 2001, the certificate holder must include in the inspection program for the airplane inspections and procedures for the fuel tank system based on those ICA.

(f) The fuel tank system inspection program changes identified in paragraphs (d) and (e) of this section and any later fuel tank system revisions must be submitted to the Principal Inspector for review and approval.

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

(1) Bombardier CL-44

(2) Concorde

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

(4) VFW-Vereinigte Flugtechnische Werk VFW-614

(5) Illyushin Aviation IL 96T

(6) Bristol Aircraft Britannia 305

(7) Handley Page Herald Type 300

(8) Avions Marcel Dassault - Breguet Aviation Mercure 100C

(9) Airbus Caravelle

(10) Lockheed L-300

45. Re-designate § 125.248 as new § 125.505, remove and reserve paragraph (b), and revise the section heading of newly re-designated § 125.505 to read as follows:

**§ 125.505 Repairs assessment for pressurized fuselages.**

* * * * *

**§ 125.248 [Reserved]**

46. Add and reserve a new § 125.248.

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

47. The authority citation for part 129 continues to read as follows:

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

**§ 129.16 [Re-designated as § 129.109]**

48. Re-designate § 129.16 as § 129.109.

**§ 129.32 [Re-designated as § 129.107]**

49. Re-designate § 129.32 as § 129.107, revise the section heading of newly re-designated § 129.107, and remove and reserve paragraph (b). The revised heading reads as follows:

**§ 129.107 Repairs assessment for pressurized fuselages.**

* * * * *

**§ 129.33 [Re-designated as §129.105]**

50. Re-designate § 129.33 as § 129.105.

51. Designate newly re-designated §§ 129.105, 129.107, and 129.109 as Subpart B and add a new subpart heading to read as follows:

SUBPART B—CONTINUED AIRWORTHINESS AND SAFETY IMPROVEMENTS

* * * * *

52. Designate existing §§ 129.1, 129.11, 129.13, 129.14, 129.15, 129.17, 129.18, 129.19, 129.20, 129.21, 129.22, 129.23, 129.25, 129.28, and 129.29, as Subpart A and add a new subpart heading to read as follows:

SUBPART A—GENERAL

* * * * *

53. Revise paragraph (b) of § 129.1 to read as follows:

**§ 129.1 Applicability and definitions.**

* * * * *

(b) *Operations of U.S.-registered aircraft solely outside the United States.* In addition to the operations specified under paragraph (a) of this section, §§ 129.14 and 129.20 and subpart B of this part also apply to U.S.-registered aircraft operated solely outside the United States in common carriage by a foreign person or foreign air carrier.

* * * * *

54. Add § 129.101 to subpart B to read as follows:

**§ 129.101 Purpose and definition.**

(a) This subpart requires a foreign person or foreign air carrier operating a U.S. registered airplane in common carriage to support the continued airworthiness of each airplane. These requirements may include, but are not limited to, revising the maintenance program, incorporating design changes, and incorporating revisions to Instructions for Continued Airworthiness.

(b) For purposes of this subpart, the "FAA Oversight Office" is the aircraft certification office or office of the Transport Airplane Directorate with oversight responsibility for the relevant type certificate or supplemental type certificate, as determined by the Administrator.

**§ 129.103 [Reserved]**

55. Add and reserve § 129.103 to subpart B.

56. Add § 129.111 to subpart B to read as follows:

**§ 129.111 Electrical wiring interconnection systems (EWIS) maintenance program.**

(a) Except as provided in paragraph (f) of this section, this section applies to transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958, that, as a result of original type certification or later increase in capacity, have –

(1) A maximum type-certificated passenger capacity of 30 or more, or

(2) A maximum payload capacity of 7500 pounds or more.

(b) After March 10, 2011, no foreign person or foreign air carrier may operate a U.S.-registered airplane identified in paragraph (a) of this section unless the maintenance program for that airplane includes inspections and procedures for EWIS.

(c) The proposed EWIS maintenance program changes must be based on EWIS Instructions for Continued Airworthiness (ICA) that have been developed in accordance with the provisions of Appendix H of part 25 of this chapter applicable to each affected airplane (including those ICA developed for supplemental type certificates installed on each airplane) and that have been approved by the FAA Oversight Office.

(1) For airplanes subject to § 26.11 of this chapter, the EWIS ICA must comply with paragraphs H25.5(a)(1) and (b).

(2) For airplanes subject to § 25.1729 of this chapter, the EWIS ICA must comply with paragraph H25.4 and all of paragraph H25.5.

(d) After March 10, 2011, before returning a U.S.-registered airplane to service after any alterations for which EWIS ICA are developed, the foreign person or foreign air carrier must

include in the maintenance program for that airplane inspections and procedures for EWIS based on those ICA.

(e) The EWIS maintenance program changes identified in paragraphs (c) and (d) of this section and any later EWIS revisions must be submitted to the Principal Inspector or Flight Standards International Field Office responsible for review and approval.

(f) This section does not apply to the following airplane models:

(1) Lockheed L-188

(2) Bombardier CL-44

(3) Mitsubishi YS-11

(4) British Aerospace BAC 1-11

(5) Concorde

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

(7) VFW-Vereinigte Flugtechnische Werk VFW-614

(8) Illyushin Aviation IL 96T

(9) Bristol Aircraft Britannia 305

(10) Handley Page Herald Type 300

(11) Avions Marcel Dassault - Breguet Aviation Mercure 100C

(12) Airbus Caravelle

(13) Lockheed L-300

57. Add § 129.113 to subpart B to read as follows:

**§ 129.113 Fuel tank system maintenance program.**

(a) Except as provided in paragraph (g) of this section, this section applies to transport category, turbine-powered airplanes with a type certificate issued after January 1, 1958, that, as a result of original type certification or later increase in capacity, have –

(1) A maximum type-certificated passenger capacity of 30 or more, or

(2) A maximum payload capacity of 7500 pounds or more.

(b) For each U.S.-registered airplane on which an auxiliary fuel tank is installed under a field approval, before June 16, 2008, the foreign person or foreign air carrier operating the airplane must submit to the FAA Oversight Office proposed maintenance instructions for the tank that meet the requirements of Special Federal Aviation Regulation No. 88 (SFAR 88) of this chapter.

(c) After December 16, 2008, no foreign person or foreign air carrier may operate a U.S.-registered airplane identified in paragraph (a) of this section unless the maintenance program for that airplane has been revised to include applicable inspections, procedures, and limitations for fuel tank systems.

(d) The proposed fuel tank system maintenance program revisions must be based on fuel tank system Instructions for Continued Airworthiness (ICA) that have been developed in accordance with the applicable provisions of SFAR 88 of this chapter or § 25.1529 and part 25, Appendix H, of this chapter, in effect on June 6, 2001 (including those developed for auxiliary fuel tanks, if any, installed under supplemental type certificates or other design approval) and that have been approved by the FAA Oversight Office.

(e) After December 16, 2008, before returning a U.S.-registered airplane to service after any alteration for which fuel tank ICA are developed under SFAR 88, or under § 25.1529 in effect on June 6, 2001, the foreign person or foreign air carrier must include in the maintenance program for the airplane inspections and procedures for the fuel tank system based on those ICA.

(f) The fuel tank system maintenance program changes identified in paragraphs (d) and (e) of this section and any later fuel tank system revisions must be submitted to the Principal Inspector or Flight Standards International Field Office responsible for review and approval.

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

(1) Bombardier CL-44

(2) Concorde

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

(4) VFW-Vereinigte Flugtechnische Werk VFW-614

(5) Illyushin Aviation IL 96T

(6) Bristol Aircraft Britannia 305

(7) Handley Page Herald Type 300

(8) Avions Marcel Dassault - Breguet Aviation Mercure 100C

(9) Airbus Caravelle

(10) Lockheed L-300

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Robert A. Sturgell

Acting Administrator