DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 1, 25, 91, 121, 125, 129

[Docket No. FAA–2004–18379; Notice No. 05–08]

RIN 2120–AI31

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

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: The intent of this proposal is to help ensure the continued safety of commercial airplanes by improving the design, installation, and maintenance of their electrical wiring systems as well as by aligning those requirements as closely as possible with the requirements for fuel tank system safety. This proposed rulemaking consists of regulatory changes affecting wiring systems and fuel tank systems in transport category airplanes. First, it proposes to organize and clarify design requirements for wire systems by moving existing regulatory references to wiring into a single section of the regulations specifically for wiring and adding new certification rules. It also proposes to require 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 would require operators to incorporate those ICA for wiring into their maintenance or inspection programs. And finally, this proposed rulemaking would clarify requirements of certain existing rules for operators to incorporate ICA for fuel tank systems into their maintenance or inspection programs.

DATES: Send your comments on or before February 3, 2006.

ADDRESSES: You may send comments [identified by Docket Number FAA–2004–18379] using any of the following methods:

- DOT Docket Web site: Go to *http://dms.dot.gov* and follow the instructions for sending your comments electronically.
- Government-wide rulemaking Web site: Go to *http://www.regulations.gov* and follow the instructions for sending your comments electronically.
- Mail: Docket Management Facility; U.S. Department of Transportation, 400 Seventh Street, SW., Nassif Building, Room PL–401, Washington, DC 20590–001.
- Fax: 1–202–493–2251.
- Hand Delivery: Room PL–401 on the plaza level of the Nassif Building, 400 Seventh Street, SW., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

For more information on the rulemaking process, see the **SUPPLEMENTARY INFORMATION** section of this document.

Privacy: We will post all comments we receive, without change, to *http://dms.dot.gov,* including any personal information you provide. For more information, see the Privacy Act discussion in the **SUPPLEMENTARY INFORMATION** section of this document.

Docket: To read background documents or comments received, go to *http://dms.dot.gov* at any time or to Room PL–401 on the plaza level of the Nassif Building, 400 Seventh Street, SW., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: Stephen Slotte, ANM–111, Airplane & Flight Crew Interface, Federal Aviation Administration, 1601 Lind Avenue SW., Renton, WA 98055–4056; telephone (425) 227–2315; facsimile (425) 227–1320, e-mail *steve.slotte@faa.gov* (certification rules) or Fred Sobeck, AFS–304, 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* (operating rules).

SUPPLEMENTARY INFORMATION:

Comments Invited

The FAA invites interested persons to participate in this rulemaking by submitting written comments, data, or views. We also invite comments relating to the economic, environmental, energy, or federalism impacts that might result from adopting the proposals in this document. The most helpful comments reference a specific portion of the proposal, explain the reason for any recommended change, and include supporting data. We ask that you send us two copies of written comments.

We will file in the docket all comments we receive, as well as a report summarizing each substantive public contact with FAA personnel about this proposed rulemaking. The docket is available for public inspection before and after the comment closing date. If you wish to review the docket in person, go to the address in the **ADDRESSES** section of this preamble between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. You may also review the docket using the Internet at the Web address in the **ADDRESSES** section.

Privacy Act: Using the search function of our docket Web site, anyone can find and read the comments received into any of our dockets, including the name of the individual sending the comment (or signing the comment on behalf of an association, business, labor union, etc.). You may review DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (65 FR 19477–78) or you may visit *http://dms.dot.gov.*

Before acting on this proposal, we will consider all comments we receive on or before the closing date for comments. We will consider comments filed late if it is possible to do so without incurring expense or delay. We may change this proposal in light of the comments we receive.

If you want the FAA to acknowledge receipt of your comments on this proposal, include with your comments a pre-addressed, stamped postcard on which the docket number appears. We will stamp the date on the postcard and mail it to you.

Availability of Rulemaking Documents

You can get an electronic copy using the Internet by:

(1) Searching the Department of Transportation's electronic Docket Management System (DMS) Web page (*http://dms.dot.gov/search*);

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

Organization of This NPRM

Discussion of the proposal in this NPRM is organized under the following headings. Material supplementary to this discussion, but not included in it, appears in appendices at the end of the discussion, before ''List of Subjects.'' Whenever there is a reference to a document being included in the docket

for this NPRM, the docket referred to is Docket Number FAA–2004–18379. A list of acronyms used is included as Appendix A. Unless stated otherwise, rule sections referenced in this NPRM are part of Title 14 of the Code of Federal Regulations.

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I. Executive Summary

Safety concerns about wiring systems in airplanes were brought to the forefront of public and governmental attention by a mid-air 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 determined to be a wiring failure causing a spark to enter the fuel tank. All 230 people aboard 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, a region of resolidified copper on 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 subsequent examinations of other airplanes showed that 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 concluded that 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. Wiring failures result in airplane delays, unscheduled landings, in-flight entertainment system problems, nonfatal accidents, and fatal accidents.

Up until this time, airplane wiring has never been singled out for special attention during maintenance inspections. Although close attention is paid to safe design within systems, we had assumed that for the wiring providing power to those systems, standard industry practice was appropriate, and modifications have often been performed without scrutiny for the effect their wiring additions may have on other systems in the airplane. Damaged wire and insulation can cause electrical arcing, providing the spark that can cause fire. Dust, dirt, lint, contamination, and vapors provide fuel for fire. Recent rules have established requirements for wiring connected to fuel tank systems. This proposal goes further, to address all the wiring contained in an airplane as systems on their own and provide scrutiny to the conditions that affect their safe functioning. It aligns with the requirements for fuel tank wiring.

We are proposing 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 proposing requirements for type certificate holders and applicants for type certificates and supplemental type certificates to analyze all the zones of their airplanes for the presence of wire and for the likelihood of contaminant materials. The proposal would also require them to develop maintenance and inspection tasks to identify, correct, and prevent wiring conditions that cause risk to continued safe flight. We are proposing 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. We are further proposing to amend Title 14 Code of Federal Regulations (CFR) parts 91, 121, 125 and 129 operating rules to require operators of transport airplanes to incorporate those tasks for wiring and fuel tanks into their regular maintenance programs. Finally, we are creating a new subpart of part 25 to contain all applicable certification requirements for airplane wiring, including new rules to improve safety in manufacture and modification.

The total estimated benefits of the proposal are comprised of efficiency benefits and safety benefits. The efficiency benefits are $192.3 million ($78.3 million present value). The safety benefits are $563 million ($262.4 million present value). From 1995–2002, 397 wiring failures were reported. We used industry estimates to determine that 68% of those failures would be detectable. The 7 most common—burned, loose, damaged, shorted, failed, chafed, and broken wires—account for 84% of all wiring failures. Wiring failures cause 22.1 flight delays per year, with an average time of 3.5 hours and an estimated cost of approximately $35,639 each, and without this proposal, we believe that wiring delays will increase proportionately with the growth of the fleet. Wiring failures cause 27.5 unscheduled landings per year at an average cost of approximately $200,461 per unscheduled landing. We estimate that, based on expected fleet growth of 3.82% per year, there will be 1,118 unscheduled landings caused by wiring failures over a 25-year period, of which approximately 760 would be prevented by this proposal, resulting in a total benefit of averting unscheduled landings of $152.4 million. Delays and unscheduled landings contain safety risks for passengers and crew and increase the likelihood of a more serious event. We estimate 32.8 wiring-related incidents or accidents could be prevented by this proposal in the next 25 years, for a total safety benefit of $563 million ($262.4 million present value). This includes 1.2 fatal accidents that can be prevented.

The estimated total cost of this NPRM is $474.4 million ($209.2 million present value) over 25 years. The total estimated benefits are $755.3 million

($340.7 million present value) over the same period. This proposal 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.

II. Background

A. Flight 800 Accident

Safety concerns about wiring systems in airplanes were brought to the forefront of public and governmental attention by a 1996 accident over the Atlantic Ocean near East Moriches, New York, involving a 747–131 airplane, operated as TWA Flight 800. That accident was investigated extensively by the National Transportation Safety Board (NTSB). It also prompted the FAA to investigate fuel tank wiring, and to focus on aging wiring in general. On May 7, 2001, the FAA published a final rule titled ''Transport Airplane Fuel Tank System Design Review, Flammability Reduction, and Maintenance and Inspection Requirements'' (66 FR 23086) to specifically address safety of the fuel tank, including wiring, which was determined to be the probable cause of the TWA Flight 800 accident. This NPRM addresses safety concerns related to aging wiring in general, and incorporates maintenance requirements specific to fuel tanks.

The NTSB determined the probable cause of the TWA Flight 800 accident, in which the airplane broke up in flight, was an explosion of the center wing fuel tank (CWT) resulting from ignition of the flammable fuel and air mixture in the tank. The source of ignition energy for the explosion could not be determined with certainty. However, of all the sources evaluated, the most likely was a wiring failure outside the CWT. This failure allowed excessive electrical energy to enter the CWT through electrical wiring associated with the fuel quantity indication system (FQIS).

During its investigation, the NTSB found several potentially unsafe conditions in and near the electrical wiring of the accident airplane. The findings included cracked wire insulation, metal shavings adhered to a floor beam where FQIS wires would have been routed (consistent with maintenance records describing compressed air being used to blow metal shavings off avionics units), other debris, and sulfide deposits. In addition, it found evidence of several repairs that did not comply with the guidelines in Boeing's ''Standard Wiring Practices Manual'' (SWPM). Noncompliant repairs included:

- Use of an oversized strain relief clamp on the terminal block of the number 1 fuel tank compensator. The clamp did not adequately secure the wires.
- Many open-ended (rather than sealed) wire splices, which exposed conductors to possible water contamination.
- Several wire bundles containing many wire splices on adjacent wires at the same location.
- Excessive solder on the connector pins inside the fuel totalizer gauge. The solder had apparently caused inadvertent joining of connecting pins/wires from the right main fuel tank and CWT FQIS.

Some of these conditions may suggest the need for improved maintenance. However, the NTSB found that deterioration, damage, and contamination of aircraft wiring and related components, such as those found on the accident airplane, were common in other transport category airplanes inspected as part of the accident investigation. This was especially true in older airplanes. The NTSB concluded that ''the condition of the wiring system in the accident airplane was not atypical for an airplane of its age and one that had been maintained in accordance with prevailing industry practices.''

The NTSB expressed concern about the damage and contamination found on electrical wiring and components during their examinations of numerous transport category airplanes, including the accident airplane. The conditions found were especially disturbing because it was clear from those examinations that much aircraft wiring is difficult, if not impossible, to inspect and test because of its inaccessibility.

The NTSB concluded that inadequate attention to the condition of aircraft electrical wiring had resulted in potential safety hazards. The conclusions from the accident investigation brought a heightened awareness to the FAA, other government agencies, and the general public of the importance of maintaining the integrity of aircraft wiring. A copy of the NTSB findings (NTSB Aircraft Accident Report Number AAR–00/03) can be found on the NTSB Web site *http://www.NTSB.gov,* and is contained in the docket.

B. Flight 111 Accident

Two years after the Flight 800 accident, in September 1998, an MD–11 airplane, operated as Swissair Flight 111, crashed into the Atlantic Ocean off the coast of Nova Scotia, Canada. There were no survivors. Within approximately 53 minutes of the airplane's departure from New York to Geneva, Switzerland, the flightcrew smelled an abnormal odor in the cockpit. The cockpit voice recorder indicates that they thought the smell was coming from the air-conditioning system. A short time after the flightcrew noticed the smell, there was smoke in the cockpit, and they diverted the airplane to the Halifax airport.

While preparing for landing, the flightcrew were unaware that fire was spreading above the ceiling in the front of the aircraft. They declared an emergency and signaled a need to land immediately. About one minute later, radio communications and secondary radar contact with the aircraft were lost, and the flight recorders stopped functioning. About five and one-half minutes later, the aircraft crashed into the ocean.

In its final report, ''Aviation Investigation Report, In-Flight Fire Leading to Collision with Water,'' Report Number A98H0003, the Transportation Safety Board of Canada (TSB) (the Canadian governmental body charged with aircraft accident investigation) could not identify the exact cause of the fire. As part of its 11 findings of causes and contributing factors, however, the TSB stated that: ''A segment of in-flight entertainment network power supply unit cable exhibited a region of resolidified copper on one wire that was caused by an arcing event. This resolidified copper was determined to be located in the area where the fire most likely originated. This arc was likely associated with fire initiation event; however, it could not be determined whether this arced wire was the lead event.'' That report can be found in the docket.

In the section of the report entitled ''Findings as to Risk,'' the TSB cited 24 separate risks that had the potential to degrade aviation safety but could not be shown to have played a direct role in the event, or are unrelated to this event but were found during the investigation. Among those findings of risks are the following statements. (The numbers under which each finding appears in the TSB report are indicated.)

- ''Regulations do not require that aircraft be designed to allow for the immediate de-powering of all but the minimum essential electrical systems as part of an isolation process for the purpose of eliminating potential ignition sources.'' (3.2.3)
- ''Examination of several MD–11 aircraft revealed various wiring discrepancies that had the potential to result in wire arcing. Other agencies have found similar discrepancies in

other aircraft types. Such discrepancies reflect a shortfall within the aviation industry in wire installation, maintenance, and inspection procedures.'' (3.2.7)

• ''The consequence of contamination of an aircraft on its continuing airworthiness is not fully understood by the aviation industry. Various types of contamination may damage wire insulation, alter the flammability properties of materials, or provide fuel to spread a fire. The aviation industry has yet to quantify the impact of contamination on the continuing airworthiness and safe operation of an aircraft.'' (3.2.8)

• ''There is no guidance material to identify how to comply with the requirements of Federal Aviation Regulation (FAR) 25.1353(b) [relating to cable routing] in situations where physical/spatial wire separation is not practicable or workable, such as in confined areas.'' (3.2.10)

• ''Inconsistencies with respect to CB (circuit breaker) reset practices have been recognized and addressed by major aircraft manufacturers and others in the aviation industry. Despite these initiatives, the regulatory environment, including regulations and advisory material, remains unchanged, creating the possibility that such ''best practices'' will erode or not be universally applied across the aviation industry.'' (3.2.12)

• ''FAR 25.1309 requires that a system safety analysis be accomplished on every system installed in an aircraft; however, the requirements of FAR 25.1309 are not sufficiently stringent to ensure that all systems, regardless of their intended use, are integrated into the aircraft in a manner compliant with the aircraft's type certificate.'' (3.2.21)

In addition to the two accidents discussed above, multiple incidents and accidents that have occurred over the years illustrate the types of wire malfunctions that can affect flight safety. A discussion of some of those, titled ''EAPAS NPRM Supplemental Material, Other Incidents and Accidents Involving Electrical Wiring,'' is included in the docket for this NPRM.

C. FAA Aging Transport Nonstructural Systems Plan

After the Flight 800 accident, at the recommendation of the White House Commission on Aviation Safety and Security (WHCSS), the FAA expanded its Aging Aircraft Program, which in the past had focused on structures, to cover nonstructural systems. We formed a team to study aging nonstructural systems and conduct detailed physical evaluations of aging airplanes. We reviewed the report from that study team, along with information from meetings with FAA principal inspectors and representatives of major airplane manufacturers, as well as an analysis of airplane service histories. From this combined information, we developed the Aging Transport Nonstructural Systems Plan (included in the docket for this NPRM). The plan's primary focus is on electrical wiring systems. There are other on-going research and development activities that address mechanical and avionics systems.

The July 1998 Aging Transport Nonstructural Systems Plan includes results of the evaluation of five transport category airplanes considered representative of the ''aging fleet of transport airplanes.'' The FAA found conditions similar to those the NTSB found during its investigation of the TWA Flight 800 accident. Those conditions included:

• Deterioration of wiring and related components.

• Stiff and cracked wire.

• Contamination of wire bundles with metal shavings, dust, and fluids.

• Corrosion on connector pins.

• Improper wire installation and repairs.

The FAA also found, as had NTSB investigators, that wires contained in wire bundles are difficult to inspect.

The conclusions reached from this evaluation were that:

• Current maintenance practices do not adequately address wiring components.

• Wire inspection criteria are too general.

• Unacceptable conditions, such as improper repairs and installations, are not described in enough detail in maintenance instructions.

• Repair instructions and data are difficult to extract from SWPMs.

• The information that maintenance personnel are given for wire replacement may not be adequate.

• Current incident/maintenance reporting procedures do not allow for easy identification of failures.

The NTSB agreed with these conclusions.

The Aging Transport Nonstructural Systems Plan detailed several tasks and associated subtasks aimed at correcting these problems, including:

• Improving wiring inspection criteria and providing more detailed descriptions of undesirable conditions.

• Improving inspector training to ensure that it adequately addresses the recognition and repair of aging wiring components.

• Developing new methods for nondestructive testing of wiring.

The NTSB responded to the issues defined in the Aging Transport Nonstructural Systems Plan. They concluded that they are important safety issues and must be fully addressed through rulemaking or other means. Specifically addressed by the NTSB (NTSB Recommendation No. A–00–108, included in the docket) were the need for:

• Improved training of maintenance personnel to ensure adequate recognition and repair of potentially unsafe wiring conditions;

• Improved documentation and reporting of potentially unsafe electrical wiring conditions; [1] and

• Incorporation of the use of new technology, such as arc-fault circuit breakers and automated wire test equipment.

The NTSB also recommended (NTSB Recommendation A–00–106, included in the docket) that the FAA review the design specifications for aircraft wiring systems of all U.S.-certified aircraft and then:

• Identify which systems are critical to safety; and

• Require revisions, as necessary, to ensure that adequate separation is provided for the wiring related to those critical systems.

Finally, the NTSB recommended that the FAA ensure that all part 25 transport category airplanes, regardless of whether they are operated under parts 91, 121, 125, or 135, be included in the review of aging transport airplane systems and structures (NTSB Recommendation A–00–119, contained in the docket).

The FAA Administrator established a formal advisory committee (the Aging Transport Systems Rulemaking Advisory Committee, or ATSRAC) in 1998. Its purpose was to facilitate actions recommended by the Aging Transport Nonstructural Systems Plan (FAA Order 11110.127, Aging Transport Systems Rulemaking Advisory Committee, dated Jan. 19, 1999, included in the docket). This committee is made up of representatives of aircraft manufacturers, transport airplane operators, aerospace and industry associations, and governmental agencies.

In January 1998, the FAA assigned five tasks to ATSRAC. These included collecting data on aging wiring systems through airplane inspections, reviewing

[1] Recommendations for improved documentation and reporting and for incorporation of new technology are not addressed by this proposed rule. They are, however, part of the FAA's Enhanced Airworthiness Program for Airplane Systems (EAPAS). The EAPAS report, dated October 15, 2002, can be found in the docket for this NPRM. For a discussion of training, see ''ATSRAC Recommendations for Rulemaking'' in the same docket.

airplane manufacturers' service information, reviewing operators' maintenance programs, and providing the FAA with recommendations to improve the safety of those systems. ATSRAC's work on those tasks focused on transport category airplanes.

The ATSRAC review of data (The ''Aging Systems Task Force Aging Transport Systems Task 1 and Task 2 Final Report,'' included in the docket) yielded the following wiring-related findings:

- Nine B–727 airplanes inspected; 276 discrepancies found.
- Nine B–737 airplanes inspected; 399 discrepancies found.
- Seven B–747 airplanes inspected; 238 discrepancies found.
- Fourteen DC–8 airplanes inspected; 974 discrepancies found.
- Fifteen DC–9 airplanes inspected; 116 discrepancies found.
- Fourteen DC–10 airplanes inspected; 714 discrepancies found.
- Three L–1011 airplanes inspected; 247 discrepancies found.
- Ten A–300 airplanes inspected; 408 discrepancies found.

The results from those five initial tasks showed that problems related to wiring systems on aging airplanes were not entirely related to degradation over time. Inadequate installation and maintenance practices were identified as factors that can lead to what is commonly referred to as an ''aging system'' problem. As a result, the scope of ATSRAC's work was expanded to include improving the continued airworthiness of airplane systems, particularly wiring systems.

In May 2001, the FAA assigned four new tasks to the committee to carry out the ATSRAC recommendations on the first five tasks (66 FR 29203). These next tasks were to accomplish the following:

- Address the need for new wire system certification requirements.
- Propose changes to the standard wiring practices manual.
- Develop a training program for wire systems.
- Develop maintenance criteria for wire systems.

The results discussed earlier from ATSRAC's review of the eight models of large transport category airplanes had heightened concern about whether similar conditions existed in small transport category airplanes (airplanes with a 6- to 30-passenger seating capacity). As a result, in March 2002 (67 FR 9799), the FAA assigned another task to ATSRAC—to investigate and develop recommendations to improve the safety of electrical wiring systems in transport category airplanes certificated for fewer than 30 passengers. In response to this task, ATSRAC examined the applicability of their previous recommendations to this group of airplanes and identified issues unique to electrical wiring systems on small transport category airplanes. ATSRAC's work in this area is continuing.

Another investigative group functioning within ATSRAC, whose wiring inspections extended to the laboratory, was the Intrusive Inspection Working Group (IIWG).[2] The IIWG subjected selected wire installations on six decommissioned airplanes to an intensive, detailed visual inspection, followed by destructive testing and laboratory analysis (an intrusive inspection). They studied the results to assess the state of wire on aged airplanes as a function of wire type and service history. In addition, the results from the visual inspections were compared with the nondestructive testing and laboratory analysis to determine the efficacy of visual inspections for the detection of age-related deterioration.

The findings from the IIWG were documented in the ''Transport Aircraft Intrusive Inspection Project (An Analysis of the Wire Installations of Six Decommissioned Aircraft) Final Report,'' issued on December 29, 2000 (from now on referred to as ''Intrusive Inspection Report''). A copy is included in the docket. The findings showed that wire-related failures have multiple causes. These include:

- Localized heat damage.
- Breaches in wire insulation.
- Wire embrittlement.
- Charred wire insulation.
- Missing insulation.
- Chafing.
- Arcing.
- Arc tracking.
- Reduced insulation resistance in certain wires.
- Defective and broken connectors.
- Damage to connector backshells.

Both the nonintrusive, visual inspections on the airplane and the intrusive inspections found most wiring discrepancies were in areas of frequent maintenance activity. In addition, fluid contamination and dust and dirt accumulations were common in those areas.

The Intrusive Inspection Report identified several areas that required special emphasis. Three areas—the cockpit, electrical power centers, and power feeder cables—were considered critical. This is because chafing on wiring in these areas, combined with flammable materials close by, can result in severe outcomes, such as wire-to-structure or wire-to-wire shorting and arcing. Since a fire in these areas could present a high risk to continued safe flight and landing, the IIWG recommended more detailed inspections for those three areas. The intent was to ensure potential problems are identified and corrected. This effort led to the development of an enhanced zonal analysis procedure (EZAP) to assess risk for fire so that maintenance programs developed for wire systems in such critical areas would require more detailed inspections. An EZAP is a specific wire-focused version of the zonal analysis procedure widely used to analyze an airplane's physical areas or zones. It's used for developing maintenance tasks. One version of an EZAP is described in proposed AC 120–XX, ''Program to Enhance Transport Category Airplane Electrical Wiring Interconnection System Maintenance.''

ATSRAC made a number of recommendations to the FAA. Those recommendations and the FAA's responses to them are included in the docket in the document titled ''ATSRAC Recommendations for Rulemaking.'' ATSRAC working groups also produced four proposed advisory circulars (AC) as guidance for their recommended rulemaking. These proposed ACs are on the topics of wiring system maintenance, training, standard wiring practices manuals, and the proposed subpart H, and will be briefly discussed at the end of this preamble under the heading ''Advisory Circulars.''

D. Fuel Tank Safety Rule

In addition to the activities described earlier, in response to the TWA 800 accident, the FAA has developed an extensive program to address safety problems associated specifically with fuel tanks. As mentioned previously, on May 7, 2001, the FAA issued a final rule entitled, ''Transport Airplane Fuel Tank System Design Review, Flammability Reduction, and Maintenance and Inspection Requirements.'' This discussion refers to that final rule as the ''Fuel Tank Safety Rule.'' The Fuel Tank Safety Rule was issued to address unforeseen failure modes and the lack of specific maintenance procedures that could result in degrading the design safety features intended to preclude ignition of fuel tank vapors.

One part of the Fuel Tank Safety Rule, Special Federal Aviation Regulation 88,

[2] The IIWG was a separate but parallel group within the Aging Systems Task Force (ASTF). The Air Transport Association (ATA) formed the ASTF in June 1998 to review the effectiveness of maintenance on electrical wiring systems and assess the condition of those systems on aircraft with type certificates (TC) older than 20 years. When ATSRAC was formed in 1998, it continued the work started under the ASTF.

(SFAR 88) applies to design approval holders of certain turbine-powered transport category airplanes, and any person who modifies those airplanes later. SFAR 88 requires these regulated parties to perform safety assessments to confirm if the design of the fuel tank system precludes the existence of ignition sources in the fuel tank system. SFAR 88 also requires development of design changes and maintenance and inspection instructions to assure the safety of the fuel tank system.

Other sections of the Fuel Tank Safety Rule (referred to as the ''operational rules'') require that operators of those airplanes include fuel tank safety maintenance and inspection instructions in their existing maintenance or inspection programs. The requirements of those sections address two areas:

(i) The fuel tank systems of the ''baseline'' airplane (as originally made by the TC holder); and

(ii) The ''actual configuration'' of the fuel tank systems of each affected airplane (as modified or altered after original manufacture).

As discussed later, one purpose of this rulemaking is to make sure that the implementation of this proposal for wiring is aligned with the implementation of the Fuel Tank Safety Rule.

E. Existing Wiring Certification Regulations

Traditionally, wire has not been looked upon as having the same importance to safety as the rest of the systems for which it provides the electrical interconnection. Whereas a particular piece of electrical equipment may be the focus of intense scrutiny regarding its design, installation, and maintenance, the wires that provide the electrical interconnection to that equipment have not received the same amount of attention, except for the wiring on engines. Additionally, in the past, system safety assessments usually addressed only the effect of a wire failure on the system itself. The safety assessments have not usually identified the effect of wire failures on other systems or on the airplane.

Existing regulations fall short of providing specific wiring-related requirements that we now recognize should be included. For example, current rules do not adequately address requirements for wires in system separation, safety assessments, component selection, component identification, protection in cargo and baggage compartments, and accessibility for inspection, maintenance, and repair.

This quote from FAA Wiring Policy ANM–01–04 supports the need for more specific wiring information: ''The FAA expects the applicant to provide engineering drawings instead of merely statements such as 'install in accordance with industry standard practices,' or 'install in accordance with AC 43.13 [''Acceptable Methods, Techniques, and Practices—Aircraft Inspection and Repair'']. The FAA considers such statements inadequate because the standard practices cannot define the location or routing of the wiring to the level needed to ensure that new/modified wiring does not invalidate previous certification findings for existing airplane systems.''

III. General Discussion of the Proposal

A. Nature of the Problem

Electrical wiring systems perform roles essential to the safety of the entire airplane. They distribute power throughout the airplane, transmit signals for control, and send data. Over time, as more sophisticated computerized systems have been introduced into airplane controls, their electrical wires, cables, and associated components have become increasingly important to safe flight.

Historically, manufacturers have been required to provide maintenance-related information for airplane systems. However, there has never been a requirement for maintenance information specifically addressing wiring systems. Since January 28, 1981, design approval holders have been required to provide ICA for the airplane. ICA must be prepared in accordance with Appendix H to part 25. In developing ICA, the applicant must include certain information. This includes a description of the airplane and its systems, servicing information, and maintenance instructions, including the frequency and extent of inspections necessary to provide for the continued airworthiness of the airplane. Currently, § 25.1529 includes a requirement for an FAA-approved Airworthiness Limitations section in the ICA. This section must list those mandatory inspections, inspection intervals, replacement times, and related procedures approved under §§ 25.571 and 25.981. There are no requirements for specific information related to wiring.

Airplanes must be continually maintained and inspected, and the information contained in the ICA is used as a basis for developing a maintenance program. Yet the examinations of large transport airplanes discussed earlier revealed many anomalies in electrical wiring systems and their components, as well as contamination by dirt and debris.

Section 43.13(b) requires anyone performing maintenance or alteration to do the work in such a manner and use materials of such a quality that the condition of the aircraft, airframe, aircraft engine, propeller, or appliance worked on will be at least equal to its original or properly altered condition (with regard to aerodynamic function, structural strength, resistance to vibration and deterioration, and other qualities affecting airworthiness). Anyone performing maintenance must use methods, techniques, and practices prescribed in the current manufacturer's maintenance manual or ICA prepared by the manufacturer, or methods, techniques, and practices referred to in § 43.13(a) as acceptable to the Administrator. However, current practice has shown that, when wiring is inspected as part of the maintenance program or following alterations, it is not always cleaned appropriately for the inspection being performed. Generally, neither FAA inspectors nor airline maintenance workers have been fully aware of the vulnerable and critical condition of wire and fuel tank systems. Little focus has been placed on the importance of cleaning electrical wiring during maintenance or alteration. The result has been to hasten the aging of wiring.

Extensive research by the FAA, in partnership with the aviation industry and other government agencies, has shown that electrical wiring on transport category airplanes is subject to a breakdown of physical and functional properties. This is not just a function of time, but also because of many stresses on the wiring. These stressors include chafing, vibration, contamination, and temperature variation, all of which can cause cumulative damage. Each airplane maintenance procedure or modification, whether performed on the wiring system itself or on surrounding components, introduces possibilities for unintentional damage, changes to the previously approved wire design, or contamination of the wiring systems by fluids, foreign objects, and debris. As the aviation industry matures, there are more older airplanes in service, and the wiring in those airplanes has had more years of exposure to all these factors. Electrical wiring system malfunctions resulting from inadequate design, alteration, maintenance, inspection, and repair practices can cause incidents and accidents involving smoke, fire, and/or loss of function.

Wire contamination is a major concern, especially in older airplanes,

and it occurs in many ways. Dust, dirt, and lint from airplane carpets and seats, lavatory waste products, hydraulic fluid, engine oil, corrosion prevention compounds, and galley spills all collect over time. Liquids can corrode connectors and other wiring components and degrade wire insulation. In addition, electrical current flow in the wiring attracts dust, dirt, and lint, and they are deposited on the wiring system and surrounding airplane structure by cabin airflow. Leakage of fluid lines and spills make the wiring grimy, so more dust, dirt, and lint are attracted to them.

To fully understand why wiring system contamination is a major problem and a potential fire hazard that could prevent the safe operation of an airplane, it is necessary to understand the ''fire triangle'' of combustion. The fire triangle symbolizes three elements—oxygen, heat or ignition source, and fuel. All three are necessary for fire to occur.

In an airplane, oxygen, the first element of the triangle, is always present, because the heating and air-conditioning system must provide a suitable environment for passengers. Wiring can act as an ignition source (second element), especially if damage, such as cracked insulation or chafing, causes a short to ground or to another conductor, or if it causes arcing. Fuel for fire (third element) can be present in the form of dust, dirt, lint, hydraulic fluid, engine oil, engine fuel, and corrosion prevention compound. Eliminating or mitigating any of these elements will help remove the fire threat.

For obvious reasons, oxygen cannot be eliminated from an airplane. Wiring systems provide critical functions, so they cannot be eliminated either. But their ability to act as a fire ignition source can be mitigated by proper design, maintenance, and repair. The easiest element to alleviate is fuel for fire. The improved maintenance requirements in this proposal, as well as the more rigorous design standards, are intended to address the fuel and ignition elements of the fire triangle of combustion.

This NPRM also addresses the requirement that certain operators incorporate ICA for their fuel tank systems into their maintenance or inspection programs, to ensure the continued safe operation of those design features that minimize the potential for an ignition source in the fuel tank system. Although there are existing regulations that require these ICA, the FAA believes, based on lessons learned from SFAR 88 and industry comments, that the existing operational rules need to address several issues that have arisen since they were adopted. Also, because there are elements in the fuel tank system that include wiring, those ICA could conflict with the requirements for electrical systems in this proposal. Additionally, the FAA believes that the compliance times for the regulations for those two systems, wiring systems and fuel tank systems, should be aligned.

B. Relationship of This Proposal to Other Aging Aircraft Initiatives

The FAA, as part of a broader review and realignment of its Aging Airplane Program, has determined that certain compliance dates in existing rules and pending proposals could be better aligned, so that operators can comply more efficiently with the requirements during scheduled maintenance. Compliance dates could also impact our ability to schedule oversight programs efficiently. In addition, based on our review, we have determined that certain substantive changes are needed to improve the cost-effectiveness of these rules and proposals. Therefore, we have decided to revise these requirements and proposals and align the compliance schedules as practically as possible. Notice of these changes and a description of our Aging Airplane Program review appeared in the **Federal Register** on July 30, 2004 (69 FR 45936). The actions affected by these revisions are this proposal and three others:

- Transport Airplane Fuel Tank System Design Review, Flammability Reduction, and Maintenance and Inspection Requirements Special Federal Aviation Regulation (Fuel Tank Safety Rule) (final rule).
- Aging Airplane Safety (interim final rule).
- Widespread Fatigue Damage (pending proposal).

To prevent any conflicts within this proposal, which affects fuel tank wiring issues, changes to the operational requirements of the Fuel Tank Safety Rule requiring the incorporation of fuel tank system maintenance and inspection tasks are proposed as part of this rulemaking.

C. Alternatives to Rulemaking

Before proposing new rulemaking, the FAA must consider alternative ways to solve the safety issues under consideration. Following is a brief discussion of two of the alternatives we considered during deliberations on this rulemaking proposal.

No new regulatory action. The FAA believes that the result of no action would be continued incidents and accidents resulting from wiring system failures. We would continue to address these situations ''reactively'' on a case-by-case basis (as they occur) by issuing airworthiness directives. This is unacceptable from a safety standpoint. Improved certification regulations, inspection and maintenance programs, and ICA for wiring systems are needed to address the potential for similar problems arising on existing and future designs, and to ensure their long-term safety.

Rely on voluntary compliance with the intent of the rule by affected parties. Some in industry have suggested simply issuing ACs to give guidance on the changes that need to be made. Issuing ACs would depend on voluntary compliance, and would not be enforceable. While certain members of the industry would proceed with voluntary programs, others would not. The use of ACs alone would ensure neither consistent results nor the achievement of the safety objectives of this proposal for the current and future fleet. Previous voluntary safety assessments, such as those relating to the thrust reverser and cargo door reviews, have been difficult to complete in a timely manner because they lacked enforceability. The proposed rules provide an enforceable means to require timely completion of the actions identified as necessary to address aging electrical wiring systems.

IV. Overview of Proposal

The FAA proposes several rule changes that collectively provide a more proactive management of wiring systems. These changes would require development and implementation of ICA for wiring systems and subsequent incorporation of those ICA into the operators' maintenance or inspection program. We are also proposing changes in the certification rules to require, during design and installation of airplane systems, more attention to conditions that could compromise wire safety and accessibility.

The result of these changes to the maintenance and certification programs would be to remove, as far as possible, sources of ignition and fuel for fire from the wiring systems. In addition, a new part 25 subpart dedicated to wiring systems would be created. The current part 25 regulations for wire would be moved into this new subpart and combined with new regulations. An alignment of the compliance times for incorporation of the wire and fuel tank ICA would also occur to enable a more comprehensive treatment of those ICA and accomplishment of the maintenance instructions at time intervals consistent

with typical airplane maintenance checks.

The FAA believes that traditional ways of addressing wiring are no longer enough. Because wire damage or degradation can be the result of successive and interactive factors introduced over time, the approach to ensuring wiring safety must be analytical, multilayered, and proactive, rather than reactive. An analytical approach means assessing logically the possibilities for fire occurring. A multilayered approach means addressing multiple layers of stressors, like chafing, vibration, temperature change, and modification that act on wiring in succession or concurrently and can cause cumulative damage to an electrical system. A proactive approach means addressing conditions affecting safe flight that we know can happen—before they happen. Causes of wire degradation must be addressed separately and collectively, and analyzed in relation to the entire airplane. Based on the findings and research described earlier in this document, the FAA has determined that air carriers, operators, TC holders, supplemental type certificate (STC) holders, repair stations, and certificated maintenance personnel need to place more emphasis on wiring and fuel tank systems when performing maintenance and alterations. Currently, other than the visual inspections required by maintenance or inspection programs, maintenance is not normally performed on these systems unless an obvious discrepancy is identified. This proposal is designed to heighten awareness of the criticality of wiring systems and to change the current approach to maintaining and modifying them. Maintenance personnel need to be aware that current industry practice for maintenance and inspection of these systems is inadequate and must be improved, as provided by this proposal.

The changes proposed in this NPRM were derived from the maintenance, inspection, design, and alteration best practices developed through extensive research by ATSRAC and other groups, including the White House Commission on Aviation Safety and Security,[3] the National Science and Technology Council Committee on Technology Wire System Safety Interagency Working Group,[4] the IIWG, and safety reviews required in accordance with SFAR 88.

The following table summarizes the proposed regulatory changes that are discussed in detail in this section.

SUMMARY OF PROPOSED RULEMAKING IN THIS NPRM

Affected part of 14 CFR	Description of proposal	Applies to
1	Adds the abbreviation ''EWIS''.	
25	Harmonization rules	Applicants for type, amended, and supplemental type certificates
25	New subpart H containing: New and revised wire-related certification requirements including requirements to develop ICA for electrical wiring interconnection systems.	Applicants for type, amended, and supplemental type certificates
25	New subpart I containing: New requirements to develop ICA for electrical wiring interconnection systems in accordance with proposed § 25.1539 and the revised Appendix H for the current specified fleet.	Type certificate holders for large transport category airplanes and certain applicants for type, amended and supplemental type certificates
Parts 121/129	Requirement to incorporate new EWIS ICA into maintenance program (included in new subparts for Continued Airworthiness).	U.S. certificate holders and foreign persons operating U.S. registered large transport category airplanes
Parts 91/121/125/129	New subparts (L, Y, M, and B respectively) for Continued Airworthiness containing parts 121/129 EWIS ICA requirements (above) and: • Requirement to incorporate fuel tank ICA into maintenance program. • Redesignation of other existing requirements into these new subparts	U.S. certificate holders and foreign persons operating U.S. registered large transport category airplanes.

Currently, part 25 does not have a separate subpart governing wiring. Certification rules that apply to wiring appear throughout the regulations, under the headings ''Design and Construction,'' ''Powerplant,'' and ''Equipment.'' In some of these rules, the term ''wiring'' is not specifically used.

The discussion of proposed changes to part 25 is broken into four parts:

- Part 25 Subpart H—Electrical Wiring Interconnection Systems (EWIS).
- Part 25 Subpart I—Continued Airworthiness.
- Other Proposed Changes to Part 25.
- Part 25 Electrical System Harmonization Rules.

ATSRAC recommended placing part 25 wiring-related regulations into one section. This change would increase the visibility of these regulations and facilitate a comprehensive process for the design and certification of wire systems. ATSRAC reviewed the current part 25 to identify each regulation that related to wiring, either directly or indirectly. Each wire-related regulation was then reviewed to determine if it should be moved (in whole or in part) into the proposed new subpart. As a result of ATSRAC's recommendations, this NPRM would change some existing wire requirements, add new ones, and compile all of them into a new subpart: subpart H of part 25.

No single regulation was moved in its entirety to the new subpart, but applicable portions of regulations were moved. Some regulations easily lent themselves to division into wire and non-wire portions, while others did not. In some cases it was difficult to remove the wire-related portion and maintain the continuity of the existing regulation. In those cases, the regulation was not moved to subpart H. Instead, the current regulation remained in place and a new subpart H regulation was created to state the importance of wiring systems to the safe design of the system that is the subject of the existing regulation. Portions of some current regulations that were moved to the new subpart were divided and distributed among

[3] ''Final Report to President Clinton, February 12, 1997,'' a copy of which is in the docket.

[4] ''Review of Federal Programs for Wire System Safety,'' November 2000, in the docket.

several new subpart H sections to follow the logical structure of the new subpart. Accordingly, there is not always a one-to-one correspondence between the existing regulations and the new subpart H regulations. A table showing the correlation between proposed new regulations and the existing regulations can be found in APPENDIX B. The table in APPENDIX C compares the existing regulations to the proposed new ones. The APPENDIX D table shows which of the current wire-related rules must be changed to accommodate the new subpart and which will remain the same.

Adoption of the proposed new and revised requirements and advisory material would help prevent future occurrences of the types of incidents and accidents described in this NPRM. The creation of a new part 25 subpart for all existing, revised, and new wire system certification requirements would strengthen the role of properly designed, installed, and maintained wire systems in increasing the safety of flight. It would also provide the regulatory tools to help ensure this outcome and locate all applicable regulations in a single place that is easy to reference and use.

Certain vintage airplanes type certificated before 1958, the beginning of the jet age, would be excluded from the requirements of this proposal. They are named in paragraph (f) of § 25.1805 and in the final paragraph of each of the proposed fuel tank and EWIS operating rules. There are no known reciprocating-powered transport category airplanes currently in scheduled passenger service, and the few remaining in cargo service would be excluded. Compliance is not required for these specific older airplanes because their advanced age or small numbers would likely make compliance economically impractical.

V. Section-by-Section Discussion of Proposed Rules

The FAA proposes to add the abbreviation for electrical wiring interconnection systems (EWIS) to 14 CFR part 1—Definitions and Abbreviations. The purpose of this addition is to ensure the use of a common term for EWIS throughout the regulations. More detailed analysis of the other proposed changes and additions is outlined below.

A. Part 25 Subpart H—Electrical Wiring Interconnection Systems (EWIS)

The proposed subpart H consists of relocated, revised, and new regulations about EWIS. Unless we say otherwise, our purpose in moving requirements to subpart H is to ensure their application to EWIS. We do not intend to change their legal effect in any other way.

Section 25.1701 Definition

Proposed § 25.1701 would define what constitutes an EWIS for the purposes of complying with the proposed subpart H requirements and other EWIS-related requirements of parts 25, 121, and 129.

Current regulations do not provide a definition of a wiring system. Without this definition, the proposed rules could be inconsistently applied to various wire-related components. To completely address the safety issues associated with wiring systems, requirements must address not only the wiring itself, but also components and devices that are required to adequately install and identify each wire. Various components and devices needed to route and identify wires are critical in ensuring that a proper electrical interconnection is made and maintained.

For the purposes of this NPRM, the term ''wire'' means bare and/or insulated wire used for the purpose of electrical energy transmission, grounding, or bonding. This includes electrical cables, coaxial cables, ribbon cables, power feeders, and databuses.

A proper electrical interconnection between two or more points requires more than just wire. Making the connection in a manner that ensures both functionality and safety requires various types of components, of which wire is one. Therefore, a clear definition of an electrical interconnection is necessary. The proposed regulation provides this and at the same time introduces the term ''electrical wiring interconnection system (EWIS)'' to describe that interconnection. The term EWIS means any wire, wiring device, or combination of these, including termination devices, installed in the airplane for transmitting electrical energy between two or more termination points. The proposed regulation expands on this basic statement to clearly identify which wire-related components are included in the EWIS definition and which are not. Most wires are routed with other wires that make up wire bundles and cable assemblies (or ''looms,'' as they are sometimes called). A single wire may also be routed separately. The same definition of an EWIS is applied to a single wire or to a bundle containing hundreds of wires.

To complete an electrical connection, various types of connectors are necessary. Examples are MS connectors (MS means military specification), D-subminiature connectors, and rack and panel connectors. Any connector used to complete an electrical connection is included in the EWIS definition. The exception to this is the mating connection on those devices that are excluded from the proposed definition. The excepted devices are addressed later in this discussion.

Connector accessories fall under the definition of EWIS. Such accessories include, but are not limited to, backshells, strain reliefs, grommets, and sealing plugs. Electrical connections to devices such as relays, interrupters, switches, contactors, terminal blocks, and feed-through connectors are parts of an EWIS. For example, the connection device on a relay is considered part of the EWIS, but the relay mechanism is not, because it is a termination point. A splice can be considered an electrical connector because it performs the same role as other connection devices by providing an electrical connection between two or more wires. The failure of a splice or relay connection could create a hazardous situation by exposing bare conductors or impairing system functionality.

Although a bus bar is not a ''connector'' in the traditional sense, it is a collector and distribution device for electrical energy and thus must be treated as part of an EWIS.

Wire or wire bundles require devices to physically route and support them, such as clamps, brackets, standoffs, and other such components. These are included in the EWIS definition. Cable ties are included because they are used to hold multiple wires together and in place. The failure of one or more of these EWIS components could affect the ability of the wire to perform its intended function. It could cause collateral damage to other wires in the same or adjacent bundles or cause the bundle to fail in a way that would cause structural damage or ignite flammable material, fluid, or vapors in the area.

Some wires must pass through pressure bulkheads, so a pressure seal is needed. Failure of a pressure seal could cause damage to the wires in the wire bundle and affect the functioning of the system they support. Some wire bundles use shields or braids to protect them from electromagnetic radiation, lightning, abrasion, and other types of physical damage. Failure of the shields or braid could cause, or allow, the wires to be damaged. It could also allow unwanted electrical energy to be coupled into systems and cause system malfunction. Thus, shields, braids, and pressure seals must be considered part of the EWIS and treated as such.

Sometimes adequate physical separation distance is not possible, and some sort of protective sleeving may be

used. Since the sleeving is used to achieve separation, it must be considered part of the EWIS.

Conduits are included in the proposal because they are used to provide protection for wires as well as provide physical separation. Conduits that have electrical termination for bonding are considered part of an EWIS because the failure of the bonding could create a hazardous situation.

The definition of an EWIS includes labels or other means used for identification. This supports the proposed § 25.1711 requiring new identification criteria for wires and other EWIS components. Discussion of the proposed labeling requirements appears under the heading for § 25.1711.

The proposed regulation does not cover portable, carry-on, or other electrical equipment not certified for installation on the airplane under part 25. Examples of items not included are laptop computers and portable audio and/or video or other consumer devices typically carried on-board by passengers for personal use. Increasingly, flight and cabin crew are using laptop computers in the performance of their duties. As stated, laptops are not part of the EWIS definition, but any electrical connection used to support power and/or signal transmission 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 proposed EWIS definition does not cover fiber optic cable because fiber optic cable does not transmit electrical energy. But since fiber optics can provide functions (for example, data transmission) similar to those provided by wire, it is being expressly eliminated from the EWIS definition to avoid confusion.

The proposed definition excludes electrical wiring interconnection system components inside avionics equipment (high-frequency communication radio or flight data recorder, for instance), or the mating electrical connectors mounted on that equipment. Such equipment is produced by various manufacturers for use on a broad range of airplane models and is designed and built to various performance and environmental specifications. Environmental testing, either by means of RTCA (Radio Technical Commission for Aeronautics) Document No. RTCA DO–160, EUROCAE 55 specification (specification of the European Organization for Civil Aviation Equipment), or other environmental qualification procedures approved by the FAA, ensures that the EWIS contained within avionics equipment is robust and well suited for the airborne environments in which it will be operated.

This proposal also does not apply to miscellaneous electrical equipment if that equipment has been adequately qualified to environmental conditions and testing procedures approved by the FAA, unless that equipment is specifically included in the proposed § 25.1701 as discussed in the following paragraph.

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. We have included the components in this type of equipment because it, unlike avionics equipment, is typically designed and made for a particular airplane model or series of models. The same requirements that apply to airplane EWIS components must also be applied to the components inside that equipment. 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 EWIS in the rest of 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. Also, while this type of equipment is designed for its intended function and is manufactured and installed to the same standards as other EWIS, it is typically not qualified to an environmental standard such as RTCA DO–160.

Section 25.1703 Function and Installation: EWIS

Proposed § 25.1703 would require 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 moisture must be considered when selecting EWIS components.

Section 25.1301 requires that each item of installed equipment be of a kind and design appropriate to its intended function, be labeled (identified), be installed according to any limitations specified for it, and function properly when installed. This is a general ''catch-all'' regulation applicable to equipment and systems certified under subpart F. Because of its generality and the fact that the FAA has not published any advisory circular for this rule, § 25.1301 has not been applied in a standardized way. Currently, § 25.1301 is applicable to wire and its associated components but it does not provide sufficient wire-specific requirements to ensure proper function and installation of EWIS. It does not adequately cover all factors that need to be considered when selecting, identifying, and installing wiring components.

The requirements of § 25.1301 are the basis for the new § 25.1703, but those requirements are supplemented by new ones. Requirements from other existing sections are also moved into the new regulation, so that the proposed rule would specifically apply to EWIS components. Adoption would ensure that the selection of wires and other EWIS components, and their installation, are carried out in a safe, consistent, and standardized manner.

Section 25.1703(a)(1) would require that each EWIS component be of a kind and design appropriate to its intended function. While § 25.1301(a) contains the same requirements, § 25.1703(a)(1) is specific to EWIS components. In this context, the requirement means that components must be qualified for airborne use, or otherwise specifically assessed as acceptable for their intended use. To be ''appropriate'' means that the equipment is used in a manner for which it was designed. For example, a wire rated at 150 degrees Celsius would not be appropriate for installation in an airplane zone where the temperature exceeds 150 degrees Celsius. Wire and other components made for household or consumer products use would not be appropriate for airborne use because they are manufactured for the consumer market and not for use in an airborne environment. Exceptions to this would be wire or other consumer components shown to comply with all the applicable airworthiness requirements of part 25. In the past this showing of compliance has proven to be difficult because manufacturers of consumer products have been reluctant to modify their designs to accommodate aviation use. Aviation use of consumer products represents too small a market.

Other factors that must be considered for EWIS component selection are mechanical strength, voltage drop, required bend radius, and expected service life. Expected service life means the expected service lifetime of the EWIS. This is not normally less than the expected service life of the aircraft structure. If the expected service life requires that all or some of the EWIS components be replaced at certain

intervals, then these intervals must be specified in the ICA as required by § 25.1529.

Section 25.1703(a)(2) requires that EWIS components be installed according to their limitations. As used here, limitations means the design and installation requirements of the particular EWIS component. Examples of EWIS component limitations are maximum operating temperature, degree of moisture resistance, voltage drop, maximum current-carrying capability, and tensile strength. Section 25.1301(c) contains that requirement, but fails to specifically address the unique characteristics of EWIS. EWIS component selection and installation design must take into account various environmental factors including, but not limited to, vibration, temperature, moisture, exposure to the elements or chemicals (de-icing fluid, for instance), insulation type, and type of clamp. For example, wire bundle adhesive clamps are known to work loose during aircraft operation. Attention must be given to the selection of and methods of affixing this type of wire bundle support and it must be shown that this type of clamp is appropriate for the environment in which it will be used.

Section 25.1703(a)(3) would require that EWIS function properly when installed. This is the same requirement as § 25.1301(d). However, the § 25.1301(d) requirement is so general that it is applied in a nonstandardized manner. Sometimes the term ''function properly when installed'' has been interpreted to mean that even non-safety-related functions of a given system must function in the manner for which it was designed. The key word in understanding the intent of this proposed section is ''properly,'' as that relates to airworthiness of the airplane in which the electrical wiring interconnection systems are installed. For an EWIS component to function properly means that it must be capable of safely performing the function for which it was designed. For example, the fact that an airplane's in-flight entertainment (IFE) system fails to deliver satisfactory picture or sound quality is not what the term ''properly'' refers to and is not a certification issue. However, the failure of an EWIS component has the potential for being a safety hazard whether it is part of a safety-related system or an IFE system. Therefore, EWIS components must always function properly when installed, no matter what system they are part of. The guidance material being prepared to accompany the proposed subpart H, AC 25,17XX, ''Certification of Electrical Wiring Interconnection Systems on Transport Category Airplanes,'' will clarify these distinctions.

Section 25.1703(a)(4) is a new requirement to ensure that EWIS components be designed and installed so mechanical strain is minimized. This means the EWIS installation must be designed such that strain on the wires would not be so great as to cause wire or other components to fail. This requirement would ensure that adequate consideration is given to mechanical strain when selecting wire and cables, clamps, strain reliefs, stand-offs, and other devices used to route and support the wire bundle.

Proposed § 25.1703(b) would require that selection of wires for installation takes into account known characteristics of different wire types in relation to each specific application, to minimize risk of damage. It is important to select the aircraft wire type whose construction matches the application environment. The wire type selected must be constructed for the most severe environment likely to be encountered in service. Among other things, the proposed section would ensure that insulation types susceptible to arc tracking be used only in environments that will minimize the likelihood of that phenomenon. Arc tracking is a phenomenon in which a conductive carbon path forms across an insulating surface. A breach in the insulation allows arcing. The arcing carbonizes the insulation. The carbon residue is electrically conductive. The carbon path then provides a short circuit path through which current can flow. This can occur on either dry or wet wires. Certain types of wire insulation are more susceptible to arc tracking than others. Wire insulated with aromatic polyimide is one type that is susceptible to arc tracking. While this type of insulation is well suited for use in very low or high temperature environments, it generally should not be used in areas of an airplane prone to excessive moisture or vibration, such as those areas designated as severe wind and moisture problem (SWAMP) areas without taking into account this insulation property's unique characteristics. Installations exposed to vibration and constant flexing in a moisture-prone area would need wire type suitable for that environment. Proposed § 25.1703(c) would require that design and installation of the main power cables allow for a reasonable degree of deformation and stretching without failure. This requirement now resides in § 25.869(a)(3).

Proposed § 25.1703(d) 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 from fluid contact with components does not occur. Wires routed near a lavatory, galley area, hydraulic lines, severe wind and moisture problem areas such as wheel wells and wing trailing edges, and any other area of the airplane where moisture collection could be a concern must be adequately protected from possible adverse effects of exposure to the types of moisture in these areas.

If a TC includes subpart H in its certification basis, the TC holder would have to show compliance with the proposed EWIS requirements. For future modifications of those TCs, use of the same design practices as those used by the TC holder will enable the modifier to substantiate compliance with the subpart H requirements based on a comparison with the TC holder's methods. If modifiers choose to deviate from those design practices, they would have to substantiate compliance independently. They would also have to consider the design practices used by the TC holder in order to justify their own choice of components.

In summary, these new rules would require the designer and installer to be careful in wire type choices, system design, and installation design. The existing § 25.1301 would be amended to contain a reference to § 25.1703 for EWIS component requirements.

Section 25.1705 System Safety: EWIS

Proposed § 25.1705 would require applicants to perform a system safety assessment of the EWIS. The safety assessment must consider the effects that both physical and functional failures of EWIS would have on the airplane's safety. Based on that safety assessment, it must be shown 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 not result from a single failure.

The current regulation requiring system safety assessments is § 25.1309. But current § 25.1309 practice does not lead to the type of analysis that fully ensures all EWIS failure conditions affecting airplane-level safety are considered. This is because the current § 25.1309(a) only covers systems and equipment that are ''required by this subchapter,'' and wiring for nonrequired systems is sometimes ignored. The current safety analysis requirements of § 25.1309(b) and (d) have not always been applied to wire associated with the airplane systems that are covered by the

same rule. When they are, there is evidence of inadequate and inconsistent application. This is especially true for miscellaneous electrical equipment that is not required, such as IFE systems. Traditional thinking about these nonrequired systems has been that, since they are not required, and the function they provide is not necessary for the safety of the airplane, their failure could not affect the safety of the airplane. This is not a valid assumption because failure of an electrical wire can have hazardous or even catastrophic results regardless of the system it is associated with. Wire failure can cause serious physical and functional damage whether the wire or other EWIS components are associated with an autoland system or an IFE system. An example of this is arcing from a shorted wire cutting through flight control cables.

The Aviation Rulemaking Advisory Committee (ARAC), based on the work of its System Design and Analysis Harmonization Working Group, has made recommendations to the FAA for changes to the current § 25.1309. We are evaluating those recommendations. (A copy of those recommendations has been placed in the docket for reference.) We have considered the ARAC recommendations in developing the proposed § 25.1705.

One of the factors we considered in developing the proposed § 25.1705 is that the proposed ARAC revisions to § 25.1309 would exempt certain airplane systems, including the EWIS components associated with those systems, from having to comply with its requirements. Specifically, ARAC recommends that jamming of flight control surfaces or pilot controls covered by § 25.671(c)(3) be exempt from the requirements of § 25.1309. Single failures covered by § 25.735(b)(1) and the failure effects covered by §§ 25.810(a)(1)(v) and 25.812 would also be excepted from the revision to § 25.1309(b) recommended by ARAC. This includes wiring or other EWIS components associated with those systems. In part, proposed § 25.1705 would ensure coverage of the EWIS associated with those systems.

There are many examples of inadequate EWIS designs that have later been determined to be unsafe. Adoption of proposed § 25.1705 would help ensure that those unsafe design practices are not repeated in the future by requiring that EWIS failure conditions affecting airplane-level safety are fully considered. The current § 25.1309 does not provide that assurance.

The FAA has issued over 100 wire-related airworthiness directives (AD) since 1998. Over 50 of those were issued since 1999 to correct wiring deficiencies on the Model MD–11 airplane as delivered by the manufacturer. Airplanes as delivered from all transport category airplane manufacturers have been the subject of mandatory corrective action to correct safety-related wiring problems.

Similarly, the FAA has issued many ADs to correct unsafe EWIS installations because of postdelivery modifications. One example of this involves the IFE system installed on the Swissair MD–11 airplane that crashed off the coast of Nova Scotia and was discussed previously in this document. That modification is a clear case of not considering the effect that EWIS failures can have on airplane safety. The airplane was modified using the supplemental type certification process to add the IFE system. That system contained roughly 750 separate electronic boxes and was installed without an adequate safety assessment per § 25.1309. Although this IFE system consumed relatively large amounts of electrical power and its components and wiring were distributed throughout, below, and above the entire passenger cabin, the applicant did not thoroughly address the safety implications of routing the system wire in the same bundles as wire from other airplane systems, thus raising a concern for common cause failure to multiple essential systems. In many instances the applicant could not identify what airplane systems were associated with the wire in the bundles modified to route the IFE wiring. With the adoption of the proposed § 25.1705, this IFE system, as designed and installed on an airplane with the proposed subpart H in its type certification basis, would be subjected to a more rigorous safety assessment that would identify any inappropriate routing and force a design change.

Many other examples of type design modifications provide evidence that modifiers do not always give due consideration to the impact on safety that installation of a new or modified system may have. Modifiers continue to route the EWIS needed for modifications with, or in close proximity to, wiring from other airplane systems without identifying protection mechanisms for those systems. The current § 25.1309 and revisions to it recommended by ARAC do not contain sufficient requirements to ensure such modifications maintain the level of safety intended by the regulation.

Accordingly, a more comprehensive and specific safety assessment regulation for EWIS is necessary. The objective of the proposed § 25.1705 is to focus attention on EWIS and the safety issues associated with them by using the concepts of § 25.1309 to provide for consistent use of a more thorough and structured analysis of aircraft wiring and its associated components.

The integrated nature of wiring and the potential severity of failures demand a more structured safety analysis approach than that traditionally used under the current, or the ARAC's proposed revision to, § 25.1309. There are more failure modes that need to be addressed than have been addressed previously with traditional analyses (arcing events that occur without tripping circuit breakers, resulting in complete wire bundle failures and fire; or wire bundle failures that lead to structural damage, for example). Current § 25.1309 system safety assessments typically evaluate effects of wire failures on system functions. But they have not considered physical wire failure as a cause of the failure of other wires within the EWIS. The traditional assessments look at external factors like rotor burst, lightning, and hydraulic line rupture, but not at internal factors, like a single wire chafing or arcing event, as the cause of the failure of functions supported by the EWIS. Compliance with the proposed § 25.1705 would require addressing those failure modes at the airplane level. This means that EWIS failures would need to be analyzed to determine what effect they would have on the safe operation of the airplane.

The proposed rule language is consistent with § 25.1309 and is meant to work in conjunction with the § 25.1309 assessments performed on airplane systems. It would require that the probability of a hazardous failure condition be extremely remote and that the probability of a catastrophic failure condition be extremely improbable and not result from a single failure. The terminology and meaning of the classifications of EWIS failure conditions are identical to those proposed by ARAC in August 2002. The proposed AC produced by that working group discussing this, titled ''System Design and Analysis,'' is in the docket for this NPRM. The following table identifies and explains the failure condition terms.

CLASSIFICATION OF FAILURE CONDITIONS

Term	Explanation
No Safety Effect	Failure conditions that would have no effect on safety; for example failure conditions that would not affect the operational capability of the airplane or increase flightcrew workload.
Minor	Failure conditions that would not significantly reduce airplane safety, and involve flightcrew actions that are well within their capabilities. Minor failure conditions may include, for example: • a slight reduction in safety margins or functional capabilities; • a slight increase in flightcrew workload, such as routine flight plan changes; or • some physical discomfort to passengers or cabin crew.
Major	Failure conditions 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 significant reduction in safety margins or functional capabilities; • a significant increase in flightcrew workload or in conditions impairing flightcrew efficiency; • discomfort to the flightcrew; or • physical distress to passengers or cabin crew, possibly including injuries.
Hazardous	Failure conditions 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 conditions that would result in multiple fatalities, usually with the loss of the airplane. (**Note:** A catastrophic failure condition was defined differently in previous versions of § 25.1309 and in accompanying advisory material as ''a failure condition that would prevent continued safe flight and landing.'')

The proposed § 25.1705 would complement the § 25.1309 assessments by raising the quality of the safety assessment with respect to EWIS failures that would not be identified using the traditional methods of compliance with § 25.1309. The analysis required to show compliance with the proposed regulation is based on a qualitative approach to assessing EWIS safety as opposed to a numerical probability-based quantitative analysis. The intent is not to examine each individual wire and its relation to other wires, but rather to ensure that there are no unacceptable hazards to the airplane. This does not preclude the possibility that, should the analysis identify a failure in a given wire bundle or component(s) that may lead to a catastrophic failure condition, the design mitigation process may lead to performing a complete analysis of each wire in the relevant bundle.

The type of analysis used to show compliance with the proposed § 25.1705 can vary depending on the knowledge of the designers or modifiers of an EWIS. As stated earlier, it is important that there is thorough knowledge of what systems and functions the other wires in the same and surrounding bundles support. In the case of a post-TC modification, without this information it would be impossible to state that the modified system could not fail in a way that would cause a hazardous or catastrophic event. If this information is not available to the modifier, then the EWIS system must be designed to accommodate this lack of knowledge. This would typically mean that wire being added for the modification would need to be routed separately from existing airplane wiring.

Flowchart 1 and Flowchart 2, contained in Appendix E of this notice, illustrate the type of analysis necessary to show compliance with the proposed § 25.1705. Two separate cases are considered. Flowchart 1 is applicable to pre-type-certification work and to TCs and STCs when the modifier has all the data necessary to perform the analysis. If the analysis is conducted according to this flowchart, the available data must include identification of systems supported by the EWIS under consideration for modification and the functions associated with them. The original aircraft manufacturer has most of this data and would normally follow the Flowchart 1 method. However, this may not always be the case when the manufacturer modifies an airplane that has been previously modified by another party.

The analysis depicted in Flowchart 2 would apply to modifiers for post-TC modification who cannot identify the systems or functions contained in EWIS being considered for modification.

In both analyses, EWIS functional and physical failures are addressed. It is the physical portion that has been neglected in past system safety analyses. The proposed regulation would require an applicant to identify any physical failure of EWIS that can cause damage to co-located EWIS or other surrounding systems or structure, or injury to people. Once those physical failures are identified, their severity can be determined and design mitigation strategies can be developed and applied. The process is repeated until all known unsafe features are eliminated. The difference between the processes identified in the two flowcharts is that in Flowchart 1, all the systems and associated functions whose wires are in a bundle are known. In Flowchart 2, new wire is routed separately from existing wire. Otherwise, the analysis is the same.

In summary, the need for this new regulation is shown by experience on the part of the FAA and other governmental regulatory authorities and by service histories. Many wire-related incidents and accidents have occurred. Post-TC modifications have repeatedly introduced wiring safety problems. Airplane manufacturers have delivered airplanes that have wiring problems when they leave the factory, or such problems have later developed in service, as evidenced by resulting mandatory corrective actions. Adoption of this proposal would ensure that such problems are fully considered and addressed as part of the type certification process.

Section 25.1709 System Separation: EWIS

Proposed § 25.1709 would require applicants to design EWIS with appropriate separation to minimize the possibility of hazardous effects upon the airplane or its systems.

Safe operation of airplanes depends in part on the safe transfer of electrical energy, a function provided by airplane EWIS. If an EWIS failure should occur, the separation between the failed EWIS and other EWIS and airplane systems

plays an important role in ensuring that any hazardous effects of the failure are mitigated to an acceptable level. Thus, it is vital to design and install wiring systems with adequate separation from those systems whose interaction with the wire could create hazardous effects. Currently, part 25 certification rules do not adequately address wire system separation. The rules currently used to require system separation are § 25.1353(a), (b), and (c), but service experience has shown that compliance with these requirements, with regard to wiring systems, has not always been adequate. This is due in part to their lack of specific wording about which wiring systems are covered and which systems those wires are meant to be separated from. The proposed rule corrects these inadequacies by stating specifically that it applies to each EWIS on the airplane, and mandating specific separation requirements for certain airplane systems known to have potential for creating a hazardous condition. The term ''hazardous condition'' in this proposed rule is used in a different context than it is used in the proposed § 25.1705. Proposed § 25.1705 uses the terms ''hazardous'' and ''catastrophic'' in the context of assigning a numerical probability to failures that can cause a failure condition. Hazardous failure conditions and catastrophic failure conditions are defined in the discussion of the proposed § 25.1705. In proposed § 25.1709, the term hazardous condition means that the applicant must perform a qualitative design assessment of the installed EWIS. This assessment would involve using reasonable engineering and manufacturing judgment and assessing relevant service history to decide whether an EWIS, any other type of system, or any structural component could fail in such a way that a condition affecting the airplane's ability to continue safe operation could result. A numerical probability assessment may still be required under the requirements of the proposed § 25.1705 if the airplane-level functional hazard assessment identifies failures that could affect safe operation of the airplane.

To illustrate the type of assessment required by proposed § 25.1709, consider the following simple example involving the use of wire bundle clamps. Clamps are used to secure a wire bundle to structure in order to hold the bundle in place and route the bundle from one location to another along a predetermined path. An airplane manufacturer, using the criteria contained in the proposed advisory material for 25.1709, determines that a 2-inch separation from hydraulic lines is necessary. The manufacturer further decides that one clamp every 10 inches is needed to maintain that separation. However, there is one localized area where a single clamp failure would potentially create a hazard. This is because the area in question is a high vibration, high temperature area, subject to exposure to moisture. So the clamp in this particular area is exposed to severe environmental conditions that could lead to its accelerated degradation. The manufacturer decides that using just a single clamp every 10 inches in this area would not suffice to preclude a hazardous event. The manufacturer prescribes use of double clamps every 10 inches in that area.

The requirements of proposed § 25.1709 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.

As used in the proposed rule, the term ''separation'' is a measure of physical distance. The purpose of separation is to prevent hazards of arcing between wires in a single bundle, between two or more bundles, or between an electrical bundle and a non-electrical system or structure. In some cases, the proposal would allow separation to be achieved with a barrier or other means shown to be at least equivalent to the necessary physical distance. However, distance separation is preferred because service experience shows that use of barriers such as conduits can cause wire damage or lead to maintenance errors. In some cases, wire bundle sleeving is used to provide separation, although the sleeving itself is susceptible to the same types of damage as wire insulation.

Determining the necessary amount of physical separation distance is essential. However, the proposed rule does not mandate specific separation distances because each system design and airplane model can be unique, and because manufacturers have differing design standards and installation techniques. Instead it requires that the chosen separation be adequate so that an EWIS component failure will not create a hazardous condition. The following factors must be considered when determining the separation distance:

(1) 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.

(2) Installation design features, including the number, type, and location of support devices along the wire path.

(3) The maximum amount of slack wire resulting from wire bundle build tolerances and other wire bundle manufacturing variabilities.

(4) Probable variations in the installation of the wiring and adjacent wiring, including position of wire support devices and amount of wire slack possible.

(5) 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.

(6) Maintenance practices as defined by the airplane manufacturer's standard wiring practices manual and the ICA required by § 25.1529 and proposed § 25.1739.

(7) The maximum temperature generated by adjacent wire/wire bundles during normal and fault conditions.

The FAA recognizes that some airplane models may have localized areas where maintaining the minimum physical separation distance is not feasible. In those cases, other means of ensuring equivalent minimum physical separation may be acceptable, if testing or analysis demonstrates that safe operation of the airplane is not jeopardized. The testing or analysis program must be conservative and consider the worst possible conditions.

Paragraphs (a), (b), (c), and (d) of proposed § 25.1709 contain EWIS-related requirements derived from the existing regulations applying to electrical power generation systems and electrical equipment and installations (§§ 25.1351 and 25.1353). Section 25.1351 does not need any revision to support the proposed § 25.1709, but § 25.1353 is amended to reference § 25.1709.

The proposed requirements of § 25.1709(a) were derived from existing § 25.1353(a). While the requirements of § 25.1353(a) are retained, the portion of that requirement applicable to wiring has been moved to the proposed § 25.1709(a). Further clarification of the requirement is also included in the proposal. Section 25.1353(a) states ''* * * wiring must be installed so that operation of any one unit or system of units * * *.'' Proposed section 25.1709(a) expands on the term ''operation'' to state that it means ''operation under normal and failure conditions as defined by § 25.1309.''

Proposed section 25.1709(b) would require that each EWIS be designed and

installed so that any electrical interference likely to be present in the airplane will not result in hazardous effects on the airplane or its systems. This proposed requirement is based on new text recently added to § 25.1353(a) to harmonize part 25 with the existing text of the JAA JAR 25.1353(a).[5] The text of JAR 25.1353(a) requires that any electrical interference likely to be present in the airplane must not result in hazardous effects on the airplane or its systems except under extremely remote conditions. The proposed § 25.1709(b) is recognition of the fact that electrical interference can be introduced into airplane systems and wiring by coupling between electrical cables or between cables and coaxial lines, as well as by the other equipment that is the subject of § 25.1353(a). The proposed requirement does not adopt the JAR clause ''except under extremely remote conditions.'' This is because the intent of the requirement is not to require a numerical probability assessment of the likelihood of electrical interference or its consequences as described previously. Rather it is meant to convey that under failure conditions that may be caused by electrical inference, the resultant effects should not be such as to prevent continued safe flight of the airplane.

Proposed section 25.1709(c) contains the wire-related requirements of the current § 25.1353(b). These requirements have been expanded to add that not only wires and cable carrying heavy current are covered, but their associated EWIS components are covered as well. The proposal prescribes that any required physical separation must be achieved either by separation distance or by barrier or other means shown to be at least equivalent to an adequate separation distance.

Proposed section 25.1709(d) contains wire-related requirements of existing §§ 25.1351(b)(1) and (b)(2) and would introduce additional requirements. To show compliance with § 25.1709(d), EWIS components associated with the generating system must be considered with the same degree of attention as other components of the system, such as the electrical generators. The proposal prescribes that any required physical separation must be achieved either by separation distance or by a barrier or other means shown to be at least equivalent to an adequate separation distance. Paragraph (d)(1) would introduce a requirement to prohibit the airplane's independent electrical power sources from sharing a common ground terminating location. Paragraph (d)(2) would prohibit the airplane's static grounds from sharing a common ground terminating location with any of the airplane's independent electrical power sources. These two new requirements would help to ensure the independence of separate electrical power sources and to prevent introduction of unwanted interference into airplane electrical power systems from other airplane systems.

Paragraphs (e), (f), (g), and (h) of proposed § 25.1709 contain EWIS-related requirements from § 25.1353(d)(3). These paragraphs contain specific separation requirements for the airplane's fuel, hydraulic, oxygen, and waste/water systems. They require that EWIS have adequate separation from those systems except to the extent necessary to provide any required electrical connection to them. These paragraphs require that EWIS be designed and installed with adequate separation so a failure of an EWIS component will not create a hazardous condition and any leakage from those systems (i.e., fuel, hydraulic, oxygen, waste/water) onto EWIS components will not create a hazardous condition. The proposed requirements recognize the potential catastrophic hazard that could occur should an arcing fault ignite a flammable fluid like fuel or hydraulic fluid. An arcing fault has the potential to puncture a line associated with those systems if adequate separation is not maintained. If there is leakage from one of those systems and an arcing event occurs, fire or explosion could result. Similarly, leakage from the water/waste system can cause damage to EWIS components and adversely affect their integrity. An EWIS arcing event that punctures a water or waste line could also introduce fluids into other airplane systems and create a hazardous condition.

To prevent chafing, jamming, or other types of interference or other failures that may lead to loss of control of the airplane, EWIS in general and wiring in particular must be physically separated from flight or other control cables. Mechanical cables have the potential to cause chafing of electrical wire if the two come into contact. This can occur either through vibration of the EWIS and/or mechanical cable or because of cable movement in response to a system command. A mechanical cable could also damage other EWIS components, such as a wire bundle support, in a way that would cause failure of that component. Also, if not properly designed and installed, a wire bundle or other EWIS component could interfere with movement of a mechanical control cable by causing jamming or otherwise restricting the cable's movement. An arcing fault could damage or sever a control cable, or a control cable failure could cause damage to EWIS if not adequately separated. Therefore, proposed paragraph (i) would require an adequate separation distance or barrier between EWIS and flight or other mechanical control systems cables and their associated system components. It would further require that failure of an EWIS component must not create a hazardous condition and that the failure of any flight or other mechanical control systems cables or systems components must not damage EWIS and create a hazardous condition.

EWIS in general and wiring in particular must be routed away from high-temperature equipment, hot air ducts, and hydraulic, fuel, water, and other lines. There must be adequate separation distance in order to prevent damage to the EWIS caused by extreme temperatures and so that an EWIS failure will not damage the equipment, ducts, or lines. High temperatures can deteriorate wire insulation and other parts of EWIS components, and if the wire or component type is not carefully selected, this deterioration could lead to wire or component failure. Similarly, should an arcing event occur, the arc could penetrate a hot air duct or line and allow the release of high pressure, high temperature air. Such a release could damage surrounding components associated with various airplane systems and potentially lead to a hazardous situation. Paragraph (j) would require that EWIS be designed and installed with an adequate separation distance or barrier between the EWIS components and heated equipment, hot air ducts, and lines.

The needed reliability of some airplane systems, such as an autoland system, requires that independent, redundant systems be used. Loss of one channel of a redundant system would not decrease the ability to continue safe operation. However, if both channels of a two-channel system were lost because of a common failure, the results could be catastrophic. To maintain the independence of redundant systems and

[5] 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 proposals 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 them to ensure our proposal is also harmonized with its Certification Specifications (CS). But since the harmonization efforts involved in developing this proposal 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 proposal.

equipment so that safety functions required for safe operation are maintained, adequate separation and electrical isolation between these systems must be ensured. Paragraph (k) would require that EWIS associated with any system that requires redundancy to meet certification requirements be separated with an adequate separation distance or barrier.

Paragraph (l) of proposed § 25.1709 would require that EWIS be designed and installed so they are adequately separated from aircraft structure and protected from sharp edges and corners. The purpose of this proposal is to minimize the potential for abrasion/chafing, vibration damage, and other types of mechanical damage. Such protection is necessary because over time the insulation on a wire that is touching a rigid object, such as an equipment support bracket, will fail and expose bare wire. This can potentially lead to arcing that could destroy that wire and other wires in its bundle. Depending on the amount of electrical energy being carried by the failed wire, structural damage may also occur.

Section 25.1711 Component Identification: EWIS

Proposed § 25.1711 would require 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 would also be required.

An important aspect of ensuring safe operation of airplanes is making sure that EWIS components are properly identified. This is necessary so that modification designers, maintenance personnel, and inspectors can easily determine the function of the associated system, together with any associated separation requirements and design limitations. Clear labeling of EWIS components and easy-to-understand identification aids allow installers, inspectors, and maintainers to readily ascertain that correct system components are installed as designed, and allow modifiers to add systems with due regard to the existing protection and separation requirements.

The current part 25 certification requirement for equipment identification is § 25.1301(b) and it is applicable to ''each item of installed equipment.'' This rule is inadequate for EWIS because it does not provide the specific requirements that have been determined necessary for identifying EWIS components. Specific EWIS component identification needs to be done to prevent modifiers from unintentionally introducing unsafe design or installation features on previously certified airplanes when they install new or modified systems. Component identification would also make those performing maintenance and inspections more aware of what systems are associated with specific EWIS in the areas undergoing maintenance or inspection.

When the FAA first certifies an airplane type design, its systems are designed and installed to ensure safe operation of the airplane. Systems essential to that safe operation are often designed and installed to ensure redundancy of the system function. They have two or more circuits, or channels, that can perform the same function in case one of them malfunctions. Separate circuits (channels) typically have their own sensors, wiring, and equipment. This helps ensure that a common failure cannot cause failure of the entire system.

An example of this is the autoland system on modern transport category airplanes. The autoland system allows airplanes to land during adverse weather conditions that would otherwise prevent landing with manual techniques that rely on the flightcrew's ability to see the runway. Typically the autoland system has three channels that are physically separated and electrically segregated, so if one channel fails, the airplane can safely continue the autoland procedure. The failure of an autoland system at a critical phase of flight can be catastrophic to the airplane and its passengers. The integrity of an autoland system's design could be compromised by systems installed after certification of the autoland system. One way to prevent this is to clearly identify EWIS associated with the autoland in a way that makes it easy to see that it is associated with a critical system. Such identification would aid the designers and installers of the new system by alerting them to the presence of the critical system and allow appropriate design and installation decisions, preventing degradation of the safety of the autoland system.

The reverse is also true. For example, suppose an in-flight entertainment system is installed on an airplane and, after that installation, an autoland system is to be installed. The designers and installers of the autoland system would need to be able to identify EWIS associated with the IFE system so they do not mix IFE system EWIS with the autoland system EWIS. The IFE system is a passenger convenience item and its functionality is not important to the continued safe operation of the airplane. When the zone containing the autoland system EWIS is undergoing inspections or maintenance, easy identification of the EWIS will alert inspection or maintenance personnel to use extra caution in the area.

Proposed § 25.1711(a) uses language that is similar to existing § 25.1301(b) but is specifically applicable to EWIS components. The proposal adds the word ''consistent'' to stress the need for consistency in EWIS identification to avoid confusion and mistakes during airplane manufacturing, modification, and maintenance. This means the FAA expects airplane manufacturers to develop an EWIS identification method that facilitates easy identification of the systems that any specific EWIS component supports and use that identification method in a consistent manner throughout the airplane. The consistent identification method must be used for new type certifications and changes to those designs. Proposed § 25.1711(e) would require that modifications to type designs use EWIS identification methods that are consistent with the identification method of the original type design. The proposed requirements of paragraph (e) are discussed later in this document.

Paragraph (b) would impose additional requirements for identification detail, when assessed in accordance with the proposed requirements of § 25.1705, for EWIS components associated with:

- Systems required for safe flight and landing.
- Systems required for egress.
- Systems with potential to affect the flightcrew's ability to cope with adverse operating conditions.

Paragraph (c) would require that identifying markings required by paragraphs (a) and (b) of the proposal remain legible throughout the design life of the component. As most wire installations are designed to remain on the airplane throughout the airplane's service life, this means the identification marks must be able to be read to support the intended purpose of the markings for the life of the airplane. The method of marking must take into account the environment in which the EWIS component will be installed.

Paragraph (d) would require that the means used to identify an EWIS component does not have an adverse effect on the component's performance throughout its design life. Certain wire marking methods have the potential to damage the wire's insulation. Hot-stamp marking is one such method. According to SAE (Society of Automotive Engineers) aerospace information report

AIR5575, ''Hot Stamp Wire Marking Concerns for Aerospace Vehicle Applications,'' a copy of which is included in the docket, the hot-stamp marking method is not well suited for today's generation of aircraft wiring. As noted in the SAE document, wire insulation has become markedly thinner over the years since the procedure was first introduced in the 1940s. Because of this, problems have arisen over wire damage from excessive penetration by the hot-stamp process. The document further states: ''The frequent need for adjustments in temperature, pressure, and swell time inherent to achieving legible hot stamp wire marking provides many opportunities for error. The controls, methods, and guidance necessary to achieve satisfactory performance with hot stamp marking are often not made available to operators in smaller wire shops.''

The FAA concurs with this assessment. If damage to the insulation occurs during the marking process, it may fail later in service after it has been exposed to the sometimes-harsh environmental conditions of aircraft use. While the proposed regulation does not prohibit use of hot-stamp marking, its use is not encouraged. To comply with this paragraph, if the hot stamp marking process is used, the guidelines of SAE recommended practice ARP5369, ''Guidelines for Wire Identification Marking Using the Hot Stamp Process'' or equivalent must be followed. A copy of this document is in the docket.

In some cases it may not be practicable to mark an EWIS component directly, because of component size or identification requirements. In this case other methods of identification such as a label or sleeve must be used.

Paragraph (e) would require that EWIS modifications to the type design take into consideration the identification scheme of the original type design. This is to ensure that the consistency required by proposed § 25.1711(a) is maintained when a modification is installed. The intent of this requirement is to provide continuity in the methods used for EWIS identification on a particular model. It is not the intent of the requirement to impose on the modifier the exact wire identification methods of the airplane manufacturer. However, since the purpose of proposed § 25.1711 is to make it easy to identify those airplane systems essential to the safe operation of the airplane, it is in the best interest of safety that designers of any modifications to the original design consider the approved type design identification methods. For example it would not be appropriate for a modifier to use purple wire to identify a specific flight critical system when the approved type design used the color green, especially if the type design already uses purple wire to identify non-essential systems. Such a scheme could cause confusion and lead future modifiers or maintainers to believe that the routing of purple wires with green wires is acceptable. This is just an example and should not be construed to say that flight critical systems should use green wire or non-essential systems purple wire. The regulation does not prescribe a particular method for identification, but is meant to ensure that the consistency of the identification method required by paragraph (a) is maintained throughout the life of the airplane.

Section 25.1713 Fire Protection: EWIS

Proposed § 25.1713 would require that EWIS components meet the applicable fire and smoke protection requirements of § 25.831(c). It would further require that EWIS located in designated fire zones be at least fire resistant. Insulation on electrical wires and cables would also be required to be self-extinguishing when tested in accordance with the applicable portions of Appendix F, Part I, of part 25.

During an emergency situation it is important that airplane systems needed by the flightcrew to effectively deal with the emergency be operative. To help ensure this, § 25.869 requires that electrical systems components meet certain flammability requirements and be designed and installed to minimize probability of ignition of flammable fluids and vapors. Currently, § 25.869(a) is applicable to wiring. The proposal is to move the requirements of § 25.869(a) related to protection of wiring from fire and put them into the proposed § 25.1713. This will allow easy identification of the requirements for fire protection of EWIS, because they will be found in the proposed new subpart H, which is dedicated to EWIS regulations. Requirements of § 25.869 dealing with isolation from flammable fluid lines have been moved to the new § 25.1709 and requirements for allowance for deformation and stretching have been moved to § 25.1703. As a result, we are amending § 25.869 to accommodate this change.

Section 25.1717 Electrical Bonding and Protection Against Static Electricity: EWIS

Proposed § 25.1717(a) would require that EWIS used for electrical bonding and protection against static electricity meet the requirements of § 25.899. Proposed § 25.1717(b) would require that EWIS components used for any electrical bonding purposes (not just that used for protection against static electricity) provide an adequate electrical return path under both normal and fault conditions.

The buildup and subsequent discharge of static electricity has the potential to create hazardous conditions for both airplane systems and people. Static electricity can injure people. It can also interfere with installed electrical/electronic equipment and cause ignition of flammable vapors. We are proposing to adopt § 25.899 (as discussed in the section headed ''Electrical System Harmonization Rules'') to highlight the importance of considering electrical bonding and static electricity as a full aircraft requirement and to prevent hazardous effects of static electricity. The proper design and installation of EWIS components used to accomplish such protection is critical to ensure the hazardous effects of static discharge are minimized. For example, the cross-sectional area of bonding paths used for primary bonding paths is important in ensuring that a low electrical impedance is obtained, as is the method in which the bonding connection is made to the airplane structure. Thus, EWIS must be fully considered when designing and installing protection from the adverse effects of static electricity. The proposed § 25.1717 highlights the importance EWIS has in providing this protection and requires that EWIS components meet the same requirements as other components used to show compliance with § 25.899.

The ARAC Electrical Systems Harmonization Working Group recommended the adoption of JAR 25.1353(e) as paragraph (e) of § 25.1353. The JAR requires that electrical bonding provide an adequate electrical return path under both normal and fault conditions on airplanes with grounded electrical systems. ATSRAC recommended that the requirements of JAR 25.1353(e) be moved in their entirety to the proposed subpart H. We agree with that recommendation and, instead of adopting JAR 25.1353(e) as § 25.1353(e), we are proposing to adopt it as § 25.1717(b).

Section 25.1719 Systems and Functions: EWIS

Proposed § 25.1719 would require that EWIS components be considered in showing compliance with the certification requirements of specific airplane systems. Many of the current part 25 sections contain system specific requirements that apply to EWIS in an

indirect way. The EWIS associated with such systems play an integral role in ensuring the safe operation of the system and of the airplane. In general, the EWIS associated with any airplane system needs to be considered an integral part of that system and must be given the same design and installation attention as the rest of the system. The proposed § 25.1719(a) contains this general requirement, while paragraph (b) of the proposal identifies specific sections of part 25 that are associated with airplane systems where wire and its associated components play an important part in ensuring safety. These specific part 25 sections contain requirements that do not lend themselves to creating a separate EWIS-based Subpart H requirement.

It is the intent of the proposed § 25.1719 to require that EWIS be designed and installed to support systems required for type certification or by operating rules, including those systems addressed by the regulations specifically listed in paragraph (b) of the proposal. They must be considered part of those systems, and be given the same design and installation considerations as the rest of the system. While paragraphs (a) and (b) may seem redundant, we have listed specific sections in (b) to ensure that applicants are aware of the need to give EWIS associated with those systems the same consideration as the other components of those systems. We consider the general requirements of (a) necessary because there may be other regulations where EWIS must be considered in showing compliance with those regulations. It also ensures that EWIS is given full consideration for any system-related regulation adopted in the future.

Section 25.1721 Circuit Protective Devices: EWIS

Proposed § 25.1721 would require that electrical wires and cable be compatible with the circuit protective devices required by § 25.1357.

We recently adopted § 25.1353(d)(1) based on recommendations of ARAC, as part of the effort to harmonize the requirements of JAA JAR 25 and FAA 14 CFR part 25. Paragraph (d)(1) requires that electrical cables be 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. That requirement would be moved from § 25.1353(d)(1) into the proposed § 25.1721 in its entirety. The proposal also adds the word ''wire'' to the requirement. This is because this requirement applies to all sizes of wire, not just heavy-current-carrying cables.

Section 25.1723 Instruments Using a Power Supply: EWIS

The proposed § 25.1723 would require that EWIS components associated with flight and navigation instruments using a power supply be designed and installed so that compliance with § 25.1331 is ensured.

Section 25.1331 requires that flight and navigation instruments using a power supply must, in the event of the failure of one power source, be supplied by another power source. No change is proposed to the wording of that section.

Section 25.1725 Accessibility Provisions: EWIS

The proposed new § 25.1725 would require that means be provided to allow for inspection of EWIS and replacement of their components as necessary for continued airworthiness.

Currently, § 25.611 requires that means must be provided to allow inspection, replacement of parts, adjustment, and lubrication as necessary for principal structural elements and control systems. While wiring systems are not specifically referred to in the existing rule, the ''accessibility'' concept is easily applied to EWIS. Many of the wiring systems on airplanes today are very difficult to access and inspect. We now have an increased awareness of the importance of inspecting wiring for separation and for contamination and damage in order to ensure proper functioning, maintenance, and safety. We also know that when adjacent structures must be removed to allow access to wire installations, new possibilities for contamination, chafing, and other types of damage are introduced. Section 25.611 would be amended to specify that EWIS must meet the accessibility requirements of § 25.1725.

The intent of proposed § 25.1725 is to ensure that EWIS components be installed so that inspections, tests, repairs, and replacements can be undertaken, and that these can be carried out with a minimum of aircraft disassembly. This proposal would facilitate the proposed implementation of the new wiring inspection programs developed under proposed § 25.1739 and the operating rules contained in this proposal.

Section 25.1727 Protection of EWIS

Proposed § 25.1727 would require that cargo or baggage compartments not contain any EWIS whose failure would adversely affect safe operation. It would also require that all EWIS be protected from damage by movement of people.

Section 25.855(e) requires that no cargo or baggage compartments may contain any controls, wiring, lines, equipment, or accessories whose damage or failure would affect safe operation of the airplane unless they are protected so that they cannot be damaged by movement of cargo in the compartment and their breakage or failure will not create a fire hazard. The proposed regulations would remove the word ''wiring'' from the current language and move those requirements, as they apply to EWIS, to the proposed § 25.1727(a). Proposed § 25.855(j) would mandate that cargo or baggage compartment EWIS components must meet the requirements of § 25.1727(a).

The proposed § 25.1727(b) and (c) are new EWIS requirements that currently don't exist in part 25. Paragraph (b) would require that EWIS be designed so that damage and risk of damage from movement of people in the airplane during all phases of flight, maintenance, and service, be minimized. Paragraph (c) would require designers to minimize damage and risk of damage to EWIS by items carried onto the airplane by passengers, cabin crew, and flightcrew. These two new requirements are justified by service experience that shows wires can easily be damaged by movement of people on the airplane and by items carried on board.

Paragraph (b) would require that EWIS designers and installers consider such things as the routing of wires that could be damaged by personnel in the cargo compartments. For example, EWIS would have to be designed and installed in ways that prevent their use as hand- or footholds as much as practicable. It would further require that EWIS be protected from damage by people in the cabin or flight deck. More and more wiring is being routed to passenger seats to support increasingly complex passenger convenience features. If an airplane is equipped with seat-back monitors, for example, the electronic components necessary to support the monitor are typically mounted underneath the seat. This requires wire routing to the seats, usually through the seat tracks (structural channels used to fasten the seats to the floor) or from the side wall directly next to the seat. Many wires mounted on or under the seats have been damaged by passengers. In one case an airplane was operated with wires lying on the floor in the area where a passenger would put his feet. The wires had become dislodged from the seat track. This not only exposed the wires to damage but also posed a potential electrical shock risk to the passenger. In other cases, wires have been routed to the seats through holes cut into the cabin side wall, exposing them to damage from both passengers

and carry-on items stored beneath the seat or between the side wall and seat.

Section 25.1729 Flammable Fluid Fire Protection: EWIS

The proposed § 25.1729 would require that EWIS components be considered a potential ignition source in each area where flammable fluid or vapors might escape by leakage of a fluid system and must meet the requirements of § 25.863.

The current § 25.863 mandates that, in each area where flammable fluids or vapors might escape by leakage of a fluid system, there must be means to minimize the probability of ignition, and resultant hazards if ignition does occur. Possible ignition sources, including overheating of equipment, malfunctioning of protective devices, and electrical faults must be considered in showing compliance with this rule. Many types of electrical faults could cause ignition. Among them are sparks emitting from an avionics component, overheated electrical component surfaces, and arcing from electrical wiring. The wording of § 25.863 would not change.

Section 25.1731 Powerplants: EWIS

The proposed § 25.1731 specifies that EWIS associated with any powerplant must be designed and installed so that failure of an EWIS component will not prevent continued safe operation of the remaining powerplants or require immediate action by any crewmember for continued safe operation, in accordance with § 25.903(b). It would also mandate that design precautions be taken to minimize hazards to the airplane because of EWIS damage in the event of a powerplant rotor failure or a fire originating in the powerplant that burns through the powerplant case, in accordance with § 25.903(d)(1). The purpose of this section is to ensure proper consideration of EWIS in evaluating powerplant installation designs.

The current § 25.903(b) requires, among other things, that powerplants be arranged and isolated from each other to allow operation, in at least one configuration, so that failure or malfunction of any engine, or of any system that can affect the engine, will not prevent continued safe operation of the remaining engines or require immediate action by any crewmember for continued safe operation. Section 25.901(d)(1) requires that design precautions be taken to minimize hazards to the airplane in the event of an engine rotor failure or a fire originating within the engine that burns through the engine case.

Section 25.1733 Flammable Fluid Shutoff Means: EWIS

Proposed § 25.1733 would require 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 25.1189 requires that each engine installation and fire zone have a means to shut off or otherwise prevent hazardous quantities of fuel, oil, deicer, and other flammable fluids from flowing into or through any designated fire zone. No change is proposed for that section.

Section 25.1735 Fire Detector Systems, General: EWIS

Proposed § 25.1735 would require that EWIS associated with any installed fire protection system be considered in showing compliance with the applicable requirements for that particular system. This would be a new requirement. It does not currently exist in part 25. The current part 25 regulations contain fire detection system requirements for powerplants (§ 25.1203), lavatories (§ 25.854), and cargo compartments (§§ 25.855, 25.857 and 25.858). Each fire detection system requires electrical wire. Failure of this wire could lead to inability of the detection system to function properly. The wire and other associated EWIS components must be considered an integral part of the fire detection system and meet the requirements of the applicable regulation. The proposal would apply to all required fire protection systems with the exception of powerplants and APUs. Requirements for EWIS associated with powerplant and APU fire detection systems are contained in proposed § 25.1737.

Section 25.1737 Powerplant and APU Fire Detector System: EWIS

Proposed § 25.1737 would require that EWIS that are part of a fire or overheat detector system located in a fire zone be at least fire-resistant, as defined in § 1.1. It would also require 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.

In addition, the proposal would require that EWIS that are part of a fire or overheat detector system in a fire zone meet the requirements of § 25.1203.

The current § 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. The present rule does contain requirements for wire used in the fire detection systems. But to increase visibility of the related EWIS requirements and to gather them into one central place, a new rule devoted specifically to fire detector system EWIS is proposed.

Existing § 25.1203 would be amended to reference the new § 25.1737, thus effectively closing the loop on requirements.

Section 25.1739 Instructions for Continued Airworthiness: EWIS

Proposed § 25.1739 would require that applicants prepare EWIS ICA in accordance with the requirements of Appendix H to part 25. The proposed EWIS ICA requirements are discussed in the next section of this document.

B. Part 25 Subpart I—Continued Airworthiness and Related Part 25 Changes

As discussed below, the following proposals are applicable to holders of existing TCs for transport category airplanes and applicants for approval of design changes to those certificates. On July 12, 2005, we issued policy statement PS–ANM110–7–12–2005, ''Safety—A Shared Responsibility—New Direction for Addressing Airworthiness Issues for Transport Airplanes'' (70 FR 40166). The policy states, in part, ''Based on our evaluation of more effective regulatory approaches for certain types of safety initiatives and the comments received from the Aging Airplane Program Update (July 30, 2004), the FAA has concluded that we need to adopt a regulatory approach recognizing the shared responsibility between design approval holders (DAH) and operators. When we decide that general rulemaking is needed to address an airworthiness issue, and believe the safety objective can only be fully achieved if the DAHs provide operators with the necessary information in a timely manner, we will propose requirements for the affected DAHs to provide that information by a certain date.''

We believe that the safety objectives contained in this proposal can only be reliably achieved and acceptable to the FAA if the DAHs provide the operators with the EWIS- and fuel-tank-system-

related maintenance information required by the proposed operational rules for parts 91, 121, 125, and 129. Our determination that DAH requirements are necessary to support the initiatives contained in this proposal is based on several factors:

- Developing EWIS and fuel tank system ICA is complex. Only the airplane manufacturer, or DAH, has access to all the necessary type design data needed for the timely and efficient development of the required EWIS and fuel tank system maintenance tasks.
- FAA-approved EWIS and fuel tank system ICA need to be available in a timely manner. Due to the complexity of these ICA, we need to ensure that the DAHs submit them for approval on schedule. This will allow the FAA Oversight Office having approval authority to ensure that the ICA are acceptable, are available on time, and can be readily implemented by the affected operators. Additionally, accurate and timely information is necessary to ensure alignment with the requirements of the Fuel Tank Safety Rule (FTSR). The compliance deadline for the operational requirements of the FTSR was extended to facilitate this alignment, as stated in the **Federal Register** notice '' Fuel Tank Safety Compliance Extension (Final Rule) and Aging Airplane Program Update (Request for Comments)'' (69 FR 45936).
- The proposals in this NPRM affect a large number of different types of transport airplanes. Because the safety issues addressed by this proposal are common to many airplanes, we need to ensure that technical requirements are met consistently and the processes of compliance are consistent. This will ensure that the proposed safety enhancements are implemented in a standardized manner.
- The safety objectives of this proposal need to be maintained for the operational life of the airplane. We need to ensure that future design changes to the type design of the airplane do not degrade the safety enhancements achieved by the initial incorporation of EWIS and fuel tank system ICA. We need to be aware of future changes to the type designs to ensure that these changes do not invalidate the maintenance tasks assigned to a particular type design when the ICA are first developed under the requirements of this proposal.

Based on the above reasons and the stated safety objectives of FAA policy PS–ANM110–7–12–2005, we are proposing to implement DAH requirements applicable to EWIS and fuel tank system ICA.

In the past, we have issued a similar requirement in the form of a special federal aviation regulation (SFAR). But SFARs appear in various places in the CFR and are difficult to reference as a whole. The FAA believes that placing these types of requirements in a new subpart of part 25, which contains the airworthiness standards for transport category airplanes, would provide a single, readily accessible location for this type of requirement. Therefore, we are proposing new subpart I to part 25 to contain these requirements.

In preliminary discussions with foreign airworthiness authorities of the concept of this new subpart, they have expressed concerns that their regulatory systems may not be able to accommodate these types of requirements in their counterparts to part 25. While agreeing on the need for these types of requirements, they have suggested that it may be more appropriate to place them in part 21 or another location. As discussed below, because we expect these new subpart I requirements to be similar to new part 25 airworthiness standards, we have tentatively decided to place them in part 25. However, we specifically request comments on the appropriate location of these requirements, particularly from the foreign authorities. If, based on comments received, we conclude that another location is more appropriate, we may move them in the final rule. Because such a move would not affect the substance of the requirements themselves, we would not consider this to be an expansion of the scope of this rulemaking that would require additional notice and comment procedures.

Section 25.1 Applicability

As stated in § 25.1, part 25 currently prescribes airworthiness standards for issuance of TCs, and changes to those certificates, for transport category airplanes. As discussed in more detail above, with this NPRM the FAA is proposing to expand the coverage of part 25 to include a new subpart I containing requirements that must be complied with by current holders of these certificates. Therefore, we are proposing to amend § 25.1, ''Applicability,'' to state that part 25 also includes requirements for holders of these design certificates. As discussed in the FAA's final rule, ''Fuel Tank Safety Compliance Extension and Aging Airplane Program Update'' (69 FR 45936), this NPRM is one of several proposals for adoption of these kinds of requirements for current holders of type certificates.

A theme common to this and other possible subpart I proposed rules is that the rulemaking projects include proposals for changes to operational rules to require operators to implement programs or take other actions that the FAA has determined are necessary for safety. In several recent rules we have adopted operational requirements without a corresponding requirement for design approval holders to develop and provide the necessary data and documents to support the operators' compliance. The difficulty encountered by operators in complying with these rules has convinced us that the corresponding design approval holder requirements are necessary to enable operators to comply by the regulatory deadlines.

Section 25.2 Special Retroactive Requirements

Section 25.2 currently contains ''special retroactive requirements.'' These requirements are ''retroactive'' in the sense that they require applicants for changes to TCs to comply with requirements that were not applicable to the original TC. As discussed below, proposed subpart I would have a similar effect, in that it would impose new requirements on both existing design certificate holders and applicants for changes to those certificates. Therefore, we are proposing to amend § 25.2 to make reference to proposed subpart I.

Section 25.1801 Purpose and Definition

Paragraph (a) of this section states that this subpart would establish requirements for holders of TCs to take actions necessary to address particular safety concerns or to support the continued airworthiness of transport category airplanes. Such actions may include, but are not limited to, performing assessments, making design changes, developing revisions to ICA, and making necessary documentation available to affected persons.

The specific applicability of each subpart I rule will be established as part of the rulemaking adopting each rule. Generally this subpart would also apply to applicants for type certificates and changes that are pending as of the effective date of this rule. It would also apply to future applicants for changes to existing type certificates. Under § 21.101, the FAA may determine that it is not appropriate to require such applicants to comply with new airworthiness standards, such as proposed new subpart H. However, it is appropriate for them to comply with the same requirements as existing certificate holders. Otherwise, the safety

improvements that result from type certificate holder compliance with these requirements could be undone by later modifications.

For example, in the case of this proposed rule, as discussed below, operators would be required to revise their maintenance programs based on EWIS ICA developed by the type certificate holder. Unless future STC applicants are required to provide similar ICA for their modifications, the TC holder's ICA could become obsolete or, in some cases, even provide incorrect and potentially unsafe information as applied to the STC holder's modification. In other cases, because subpart I rules accompany corresponding operating requirements, failure of an STC applicant to comply with a subpart I rule could make it impossible for an operator to comply with the corresponding operating requirement. Subpart I does not apply to future applicants for TCs, because those applicants will be covered by other proposed changes to part 25, including Appendix H.

Therefore, adoption of a new subpart I rule would also necessitate new requirements for certification of changes to TCs that are in addition to the requirements that are specified under § 21.101. Under that section, if a change is ''significant'' and certain other criteria are met, the applicant would have to show compliance with the latest airworthiness requirements. For example, an applicant applying for such a change after this final rule becomes effective would have to comply with the proposed EWIS requirements in subpart H. Even if we determine that these broader regulations do not apply, the applicant for a change must still comply with the subpart I rule.

Paragraph (b) of this section provides a definition of the term ''FAA Oversight Office.'' The FAA Oversight Office is the aircraft certification office or office of the Transport Airplane Directorate with oversight responsibility for the relevant TC or STC, as determined by the Administrator. As stated later in the discussion of the proposed operating rules, the primary means for operators to comply with those requirements would be by implementing programs or taking other actions developed by the TC and STC holders under this proposed subpart. In each case, to ensure compliance with the relevant subpart I rule, the TC and STC holder's compliance documentation (for example, in this case, EWIS ICA) must be submitted to the FAA Oversight Office. Because we expect this will be a standard approach to compliance with the requirements of this subpart, we are including this definition in this section to avoid having to repeat it in each section within this subpart.

Section 25.1805 Electrical Wiring Interconnection Systems (EWIS) Maintenance Program

This proposal would apply to holders of TCs and to applicants for new TCs, amended TCs, and supplemental TCs if the application was filed before the effective date of this rule and the certificate was issued on or after the effective date of this rule. It would also apply to future applicants for approval of changes to existing TCs.

Paragraph (a) states that this rule would apply, with some exceptions, to transport category turbine-powered airplanes with a maximum type-certificated capacity of 30 or more passengers, or a maximum payload capacity of 7500 pounds or more resulting from the original certification of the airplane or later increase in capacity. This would result in the coverage of airplanes where the safety benefits and the public interest are the greatest.

The reference to the originally certificated capacity, or later increase in capacity, is intended to address two situations:

- In the past, some designers and operators have tried to avoid applying requirements mandated only for airplanes over specified capacities by getting a design change approval for a slightly lower capacity. By referencing the capacity resulting from original certification, this proposal would remove this possible means of avoiding compliance.
- It is also possible that an airplane design could be originally certified with a capacity slightly lower than the minimum specified in this section, but through later design changes, the capacity could be increased above this minimum. The reference to later increases in capacity would ensure that, if this occurs, the design would have to meet the requirements of this section.

Compliance is not proposed for airplanes with a certificated passenger capacity of fewer than 30 passengers, or having a maximum capacity of less than 7500 pounds payload resulting from original certification, because it is not clear at this time that the possible benefits for those airplanes would be proportionate to the cost involved. The FAA intends to evaluate the merits of applying these requirements to those airplanes. We are currently working with ATSRAC to assess how these issues might be addressed in those transport category airplanes. We request comments on the feasibility and benefits of requiring holders of TCs for those airplanes to comply with these requirements.

This proposed rule, as it applies to EWIS, is not applicable to holders of existing (already issued) STCs. Often, the wire design for STC installations of EWIS was based on operator or repair station standard practices and therefore details of the installation are not available. In the cases where such information is available, it would usually indicate that the wiring for the modification follows the same path, or is in the same airplane zone, as the wiring in the original type design. We anticipate that operators would inspect those areas while performing the TC holder's EZAP program. We also expect that any possible discrepancies will be further mitigated by operators incorporating applicable EWIS maintenance tasks into the maintenance program for that zone. Accordingly, the FAA has decided not to require compliance with this section for existing STCs. However, if an existing STC is amended, this section would apply to the amendment.

TC holders, who design EWIS on airplanes, are the technical experts who possess information about those systems. This proposal would apply to the following:

- TC holders.
- Applicants for TCs and for approval of design changes to existing TCs whose applications are pending when this rule becomes effective.
- Future applicants for approval of design changes to existing TCs.

Section 25.1805(b) would require TC holders to complete a comprehensive assessment of the EWIS of each ''representative'' airplane for which they hold a TC, develop inspection and maintenance instructions for them, and incorporate those instructions into the airplane's ICA. 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.

For example, for the Boeing Model 737, the representative airplane would be the configuration of each of the airplane series, 737–100 through 737–900 that incorporates all the variations of EWIS used in producing each airplane series. The purpose of this definition is to ensure that the TC holder considers the full range of EWIS configurations that may affect the results of the EZAP. Further, AD 99–03–04 applies to all Boeing Model 737–100, –200, –300, –400, and –500 series

airplanes. It requires installation of components to provide shielding and separation of the fuel system wiring from adjacent wiring. It also requires installation of flame arrestors and pressure relief valves in the fuel vent system. Boeing would be required to develop ICA for each of those series airplanes as modified by installation of these components and all other modifications mandated by ADs.

The purpose of including these mandated design changes is to ensure that the TC holder's EZAP addresses the existing configuration of airplanes in the operating fleet, rather than just the configuration produced and delivered by the manufacturer.

Applicants for approval of design changes would be required to evaluate the effect of their proposed change on the EWIS ICA developed by the TC holder for the representative airplane and to develop EWIS ICA to address those effects. For TC holders, this requirement would apply to any design changes that may affect the ICA for the representative airplane. This includes service bulletins describing such design changes. Under § 21.113, these design changes are amendments to the TC.

A description of what must be included in those ICA, and the EZAP that must be used to develop them, is contained in the section of this preamble discussing the proposed revision to Appendix H, part 25.

The requirement for ICA was effective on January 28, 1981. TC holders whose application was dated before that date are not subject to that requirement. This proposal would require TC holders who do not have ICA for specific airplane models to create EWIS ICA for them. As discussed below, air carriers and operators of those airplanes would then be required to revise their maintenance or inspection programs based on the new ICA for EWIS and fuel tank systems.

As discussed earlier, SFAR 88 requires TC holders to develop maintenance and inspection instructions to assure the safety of the fuel tank system. Proposed § 25.1805(b) would require that TC holders align the fuel tank system instructions with the results of the EZAP applied to EWIS to ensure compatibility and minimize redundancies. All EWIS would be subject to review in developing the EWIS ICA, and the appropriate instructions for their maintenance and inspection would be required. But some EWIS are also part of the fuel tank system. The requirements for their maintenance and inspection might be more specific than those for wiring in general, and might contain additional requirements. That is why the two must be reviewed for compatibility.

As discussed later in this section, the ICA for fuel tank system electrical wiring required by SFAR 88 will be determined in accordance with guidance provided by Policy Statement ANM100–2004–1129, ''Process for Developing Instructions for Maintenance and Inspection of Fuel Tank Systems Required by SFAR 88'' (a copy of which may be found in the docket), or other acceptable process. Compliance with Subpart I will require ICA for the same wire to be determined using an EZAP. While these processes have similarities, they may result in identification of different tasks and intervals. The ICA maintenance tasks and intervals that result from these determinations are expected to be additive. If there is a conflict in the task or interval, for purposes of this section, the FAA Oversight Office will resolve the conflict.

The ICA should be reviewed to ensure that any maintenance tasks for EWIS do not compromise fuel tank system wire requirements, such as separation or configuration specifications. If there is an inspection or maintenance requirement for EWIS and the fuel tank system within the same zone, there must be an effort to align the task interval. In addition, design certificate holder's existing documents containing EWIS and fuel tank system ICA should be reviewed to either remove or cross-reference redundant information.

The compliance plan required by this proposal must include identification of those common locations in the airplane where EWIS and fuel tank ICA apply. The considerations for compatibility and minimization of redundancy for the two systems will be reviewed and approved by the FAA Oversight Office. The plan for documenting the required ICA for EWIS and fuel tank system will also be reviewed as part of the compliance plan. These documents are critical to the effort that will be required of operators to show compliance with the operational rules contained in this proposal. We intend that the ICA information, both in content and format, will be readily usable by the affected operators for developing proposed changes to their maintenance or inspection programs. Generally, the information contained in the ICA for the fuel tank system required by SFAR 88 would include:

- The location of the fuel tank system components to be maintained or inspected and any access requirements.
- Any unique procedures required, such as special, detailed inspections or dual sign-off of maintenance records.
- Specific task information, such as inspections defined by pictures or schematics.
- Intervals for any repetitive tasks.
- Methods, techniques, and practices required to perform the task.
- Criteria for passing inspections.
- Any special equipment or test apparatus required.
- Critical Design Configuration Control Limitations—for example, wire separation or pump impeller material specifications—that cannot be altered, except in accordance with the applicable limitation.

The information for EWIS ICA would generally include:

- Identification of each zone of the airplane.
- Identification of each zone that contains EWIS.
- Identification of each zone containing EWIS that also contains combustible material.
- 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.
- The location of the EWIS components to be maintained or inspected and any access requirements.
- Any unique procedures required, such as special, detailed inspections, or a dual sign-off of maintenance records.
- Specific task information, such as inspections defined by pictures or schematics.
- Intervals for any repetitive tasks.
- Methods, techniques and practices required to perform the task.
- Criteria for passing inspections.
- Any special equipment or test apparatus required.
- Instructions for protection and caution information that will minimize contamination and accidental damage to EWIS during performance of maintenance, alterations, or repairs.
- Guidelines for identifying wiring discrepancies and assessing what effect such discrepancies, if found, could have on adjacent systems, particularly if these include wiring.
- Critical Design Configuration Control Limitations—for example, wire separation specifications—that cannot be altered, except in accordance with the applicable limitation.

Policy Statement No. PS–ANM100–2004–10029 provides guidance on acceptable processes for developing fuel tank system ICA as required by SFAR 88. The FAA expects that engineers from aircraft certification offices or from the Transport Airplane Directorate will review and approve the results of the EZAP.

The three groups whose compliance with this proposal would be required,

and their required compliance dates, indicated in paragraph (c), are as follows:

• Existing TC holders: No later than December 16, 2007.

• Current applicants for TCs and amendments to TCs (including service bulletins describing design changes) whose applications are pending and future applicants for TC amendments: No later than December 16, 2007, or the date of approval of their application, whichever is later.

• Pending and future applicants for STCs: No later than June 16, 2008, or the date of the approval of their application, whichever is later.

Future applicants for changes to TCs that comply with proposed § 25.1739 would not be required to comply with this section. As discussed previously, under § 21.101, applicants for ''significant'' changes that meet certain criteria must comply with the latest airworthiness requirements. If this NPRM is adopted as a final rule, such a future applicant would have to comply with § 25.1739. Because the proposed requirements of that section are more extensive than the proposed requirements of § 25.1805, requiring compliance with this section would be redundant.

In determining the compliance schedules for the requirements covered in this proposal, the FAA balanced the safety-related reasons for the rule against the need to give industry enough time to comply with it. Therefore, before setting the proposed compliance times for the TC holders to complete their analysis of their representative type design, the FAA considered the following:

• Input from industry.

• Current or planned compliance periods of several aging-related rulemakings, such as the pending Aging Airplane Safety proposed rule, Fuel Tank System safety initiatives (69 FR 45936, 66 FR 23086), and the pending Widespread Fatigue Damage proposal.

• Safety improvements that will result from compliance with this rule.

• Industry's current efforts to incorporate some of these safety initiatives.

ATSRAC recommended a compliance time of 24 months for TC holders to develop these ICA. To align this proposal with other rules in the aging airplane program, the FAA has adjusted the time frame to that of other rules discussed earlier, so that operators can more efficiently comply with requirements to revise their maintenance programs. To support this realignment, compliance dates that allow an 18-month time frame for TC holders to develop the EWIS ICA and 12 months for operators to implement them were determined to be appropriate and were included in this proposal. We believe these time frames are supported by the experience gained from the EZAPs already performed. Since ATSRAC made its recommendation, several manufacturers have applied an EZAP to their type design airplanes and have completed those reviews.

When we initially drafted this proposal, we assumed the final rule would be adopted by mid-2006. As a result, we set the compliance dates in the proposal using the mid-2006 time frame as the baseline. However, the proposed rulemaking process took longer than we had anticipated. Consequently, we expect that the time frame for adoption of the final rule will be sometime after mid-2006. We recognize that this delay will adversely impact the compliance dates we propose for TC holders and operators and we may need to adjust them. Therefore, we request and will consider your comments on revising the proposed compliance dates. Once the ICA are approved by the FAA Oversight Office, the submitter must make the ICA available to affected persons as required by § 21.50.

Because this proposal sets a precedent in introducing part 25 requirements for holders of existing TCs, it is the FAA's expectation that they will work closely with the FAA Oversight Office in putting together a compliance plan for developing the required ICA. Proposed section 25.1805(d) would require that the compliance plan be approved by the FAA Oversight Office as sufficient basis for showing compliance with the proposed § 25.1805.

The following table lists the FAA Oversight Offices, as currently determined by the Administrator, that oversee issuance of type certificates and amended type certificates for manufacturers of transport category airplanes with a passenger capacity of 30 passengers or a payload capacity of 7500 pounds or greater.

Airplane manufacturer	FAA Oversight Office
Aerospatiale	Transport Airplane Directorate, International Branch, ANM–116.
Airbus	Transport Airplane Directorate, International Branch, ANM–116.
BAE	Transport Airplane Directorate, International Branch, ANM–116.
Boeing	Seattle Aircraft Certification Office.
Bombardier	New York Aircraft Certification Office.
CASA	Transport Airplane Directorate, International Branch, ANM–116.
deHavilland	New York Aircraft Certification Office.
Dornier	Transport Airplane Directorate, International Branch, ANM–116.
Embraer	Transport Airplane Directorate, International Branch, ANM–116.
Fokker	Transport Airplane Directorate, International Branch, ANM–116.
Lockheed	Atlanta Aircraft Certification Office.
McDonnell-Douglas	Los Angeles Certification Office.
SAAB	Transport Airplane Directorate, International Branch, ANM–116.

Development of a compliance plan is necessary to ensure that TC holders thoroughly understand the requirements of this proposal and produce on time appropriate ICA that are acceptable in content and format in addressing the maintenance and inspection tasks for EWIS and the fuel tank system. Integral to the compliance plan will be the inclusion of procedures to allow the FAA to monitor progress towards compliance. These aspects of the plan will help ensure that the expected outcomes will be acceptable and on time for incorporation by the affected operators in accordance with the operational rules contained in this proposal.

To help ensure that TC holders are fully informed of what is necessary to show compliance with these requirements, as previously discussed, we are issuing AC 120.XX, and have issued a policy statement that describes an acceptable means, but not the only means, of complying with these requirements for developing EWIS ICA and the fuel tank system ICA required by SFAR 88. AC 120-XX, ''Program to Enhance Transport Category Airplane

Electrical Wiring Interconnection System Maintenance,'' provides an enhanced zonal analysis procedure (EZAP) for completing a review of the representative airplane covering all areas, including the flight deck (or cockpit), electrical power center, fuel tank wiring, and powerfeeder cables. Policy Statement ANM100–2004–10029, ''Process for Developing Instructions for Maintenance and Inspection of Fuel Tank Systems Required by SFAR 88,'' provides guidance for identifying ICA, including any airworthiness limitations, as a result of the fuel tank system review required by SFAR 88 and compliance with Amendment 102 to part 25 Appendix H and § 25.981.

Proposed § 25.1805(d) is intended to provide TC holders, applicants with pending TC-amendment or STC applications, and the FAA with assurance that they understand what means of compliance are acceptable and have taken necessary actions, including assigning sufficient resources, to achieve compliance with this section. This paragraph is based substantially on ''The FAA and Industry Guide to Product Certification,'' which describes a process for developing project-specific certification plans for type certification programs. A copy of this guide may be found in the docket. This planning requirement would not apply to future applicants for TC amendments or STCs because, as described in the guide, this type of planning routinely occurs at the beginning of the certification process.

The guide recognizes the importance of ongoing communication and cooperation between applicants and the FAA. Section 25.1805, while regulatory in nature, is intended to encourage establishment of the same type of relationship in the process of complying with this section. In particular, in addition to other necessary information, paragraph (d)(3) makes it clear that, to the extent that they intend to use means of compliance different from those already identified as acceptable by the FAA, it is imperative that they identify those differences at the earliest possible stage so any compliance issues can be resolved without risk of unnecessary expenditure of resources or, ultimately, noncompliance.

Proposed § 25.1805(d) would require TC holders and applicants to submit to the FAA Oversight Office the following within 90 days after the effective date of the rule:

- A proposed project schedule, identifying all major milestones, for meeting the compliance dates of this rule.
- A proposed means of compliance with this section, identifying all required deliverables, including all compliance items and all data to be developed to substantiate compliance. If any affected person has already initiated compliance, the FAA Oversight Office will review the results of those efforts to ensure that the results are acceptable.
- A detailed explanation of how the proposed means will be shown to comply with this section if the affected person proposes a means of compliance that differs from that described in FAA advisory material.
- A proposal for how the approved ICA will be made available to affected persons.

It should be noted that this section applies not only to domestic TC holders and applicants, but also to foreign TC holders and applicants. In this sense, this section is different from most type certification programs, where foreign applicants typically work with their responsible certification authority, and the FAA relies on that authority's findings of compliance under bilateral airworthiness agreements. Since this rulemaking is not harmonized in all cases, the FAA will make all the necessary compliance determinations, and where appropriate we may accept findings of compliance made by the appropriate foreign authorities using procedures developed under the bilateral agreements. The compliance planning provisions of this section are equally important for domestic and foreign TC holders and applicants, and we will work with the foreign authorities to ensure that their TC holders and applicants perform the planning necessary to comply with the requirements of this section.

One of the items required in the plan is, ''If the proposed means of compliance differs from that described in FAA advisory material, a detailed explanation of how the proposed means will comply with this section.'' FAA advisory material is never mandatory because it describes one means, but not the only means of compliance. In the area of type certification, applicants frequently propose acceptable alternatives to the means described in advisory circulars. But when an applicant chooses to comply by an alternative means, it is important to identify this as early as possible in the certification process to provide an opportunity to resolve any issues that may arise that could lead to delays in the certification schedule.

The same is true for this requirement. As discussed earlier, TC holder compliance with this section on time is necessary to enable operators to comply with the operational requirements of this NPRM. Therefore, this item in the plan would enable the FAA Oversight Office to identify and resolve any issues that may arise with the TC holder's proposal without jeopardizing the TC holder's ability to comply with this section by the compliance time.

As of the date of this proposal, certain TC holders have voluntarily started to develop the EWIS EZAP that would be required by proposed § 25.1805. An EZAP has been completed on certain transport category airplanes. Although the EZAP used by those TC holders may not be the version outlined in AC120-XX, it is similar. The FAA would expect that after issuance of the final rule, these TC holders would either submit a plan proposing revisions to the EZAP for those model airplanes to be consistent with the guidance given in AC120-XX, or use the planning process to show that their EZAP complies with this section. The FAA Oversight Office will then review the results of those efforts to ensure that the results are acceptable for compliance with this section.

Section 25.1805(e) requires that TC holders and applicants correct a deficient plan, or deficiencies in implementing the plan, in a manner identified by the FAA Oversight Office. Before the FAA formally notifies a TC holder or applicant of deficiencies, however, we will have communicated with them to try to achieve a complete mutual understanding of the deficiencies and means of correcting them. Therefore, the notification referred to in this paragraph should document the agreed corrections.

Because operators' ability to comply with the applicable operational rules will be dependent on TC holders' and applicants' compliance with § 25.1805, the FAA will carefully monitor their compliance and take appropriate action if they fail to achieve compliance. Failure to comply within the specified time would constitute a violation of the requirements and may subject the violator to certificate action to amend, suspend, or revoke the affected certificate in accordance with 49 U.S.C. § 44709. In accordance with 49 U.S.C. 46301, it may also subject the violator to a civil penalty of not more than $25,000 per day per TC until § 25.1805 is complied with.

C. Other Proposed Changes to Part 25

As explained in the preamble discussion of the proposed subpart H, some existing rules applying to EWIS would need revision in order to support the proposed new subpart. Those rules that would be changed by this proposal are:

- 25.611
- 25.855

- 25.869
- 25.1203
- 25.1301
- 25.1309
- 25.1353
- 25.1357

The changes proposed for them are discussed in the section-by-section discussion for proposed subpart H. In addition, this NPRM includes a number of other changes to part 25 requirements for electrical systems discussed later in the section headed ''Electrical System Harmonization Rules.'' The remaining changes to part 25 are discussed below.

Section 25.1357(f) System Power Removal

ATSRAC has proposed adding a requirement that airplane systems normally requiring power removal have a power switch to accomplish this, instead of relying on using the circuit breaker. The FAA has decided that this requirement belongs in § 25.1357.

It is not the intent of the proposal to require that every electrically powered system in the airplane have a means to remove power from them other than a circuit breaker. ATSRAC used the phrase ''normally requiring power removal'' to 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 the flightdeck multi-function displays or the flight management computer. But if, for example, the flight-management computer did require power cycling regularly, for whatever reason, this system would then be required to have a means to do this other than using the circuit breakers.

For systems requiring this power removal design feature, power should be removed from the system as closely as practical to the source of power instead of simply deactivating the outputs of the systems power supplies.

The ability to quickly remove power from an airplane system not required for the airplane's safe operation is important if an emergency situation demands isolation of a known or unknown source of fire or smoke. One of the first things flightcrews are instructed to do when faced with a fire or smoke emergency is to remove power from the known source or from all unnecessary systems if the source is unknown. This is to stop the fire or smoke from spreading. Currently, part 25 regulations do not require systems to have a separate shutoff feature. But the need for the flightcrew to be able to shut off unnecessary systems was tragically illustrated during the investigation of the fatal accident on September 3, 1998, of a Swissair Model MD–11, discussed earlier in this document.

After that accident, the FAA conducted a special certification review (SCR) on the IFE system installed on the airplane, and published its report (''Federal Aviation Administration Special Certification Review Team Report on: Santa Barbara Aerospace, STC ST00236LA–D, Swissair Model MD–11 Airplane, In-flight Entertainment System,'' June 9, 2000. A copy of this report is contained in the docket). One of the team's findings was that the design of the IFE system did not allow the flightcrew or cabin crew to completely remove electrical power in any other way than by pulling the system's circuit breakers. The FAA decided that this was an unsafe condition, and we issued an airworthiness directive prohibiting operation of MD–11 airplanes with that particular IFE system installed. The FAA expanded its investigation and reviewed previously issued STCs that had approved installation of IFE systems on transport category airplanes. That investigation identified over 20 STC IFE installations that had the same design characteristics as the one on the accident MD–11 airplane (no means to remove power other than by pulling the circuit breaker). We issued ADs to correct those inadequate IFE system designs. As more IFE systems with the same design characteristic are identified, ADs will be issued to correct the identified unsafe condition.

On September 18, 2000, the FAA issued a policy memorandum stating that a newly certified IFE system should have a way for the flightcrew or cabin crew to disconnect it from its source of power other than by using circuit breakers. A copy of this memorandum, titled ''Interim Policy Guidance for Certification of In-Flight Entertainment Systems on Title 14 CFR Part 25 Aircraft (Policy Number 00–111–160),'' is in the docket. Most airplane manufacturers are now equipping IFE systems on their newly delivered airplanes with a power source disconnection means. Subsequent policy covering cabin video surveillance systems also contains the same guidance (Policy Number 01–111–196, ''Interim Summary of Policy and Advisory Material Available for Use in the Certification of Cabin Mounted Video Cameras Systems with Flight Deck Displays on Title 14 CFR Part 25 Aircraft,'' included in the docket). ATSRAC (as recommended by the ATSRAC Wire Systems Harmonization Working Group and the ARAC Electrical Systems Harmonization Working Group) believes that this philosophy should be applied to any airplane system that requires having its power removed or reset during normal operations. The FAA agrees with this recommendation.

The proposed § 25.1357(f) would require that airplane systems needing a capability for having their power removed or reset during normal operations must be designed so that circuit breakers are not the primary means to do that. This is a new regulation whose requirements have not previously existed within part 25 and is a recognition that any airplane system, including an IFE system, that requires regular power removal or resetting needs to have a means to do so.

Appendix H to Part 25—Instructions for Continued Airworthiness

As previously noted, improper maintenance, repair, and modifications often hasten the ''aging'' of EWIS. To properly maintain, repair, and modify airplane EWIS, certain information must be available to the designer, modifier, and installer. This information should be part of the ICA as required by current § 25.1529 and the proposed § 25.1739.

This proposal would amend Appendix H by adding a new section, H25.5, to require TC applicants to develop maintenance information for EWIS as part of the ICA as a requirement for getting a design approval. The proposed rule would also apply to applicants for design change approvals (supplemental TCs and amended TCs).

The proposal would require applicants for TCs to prepare ICA for EWIS that are approved by the FAA Oversight Office, in the form of a document that is easily recognizable as an EWIS ICA. To prepare these instructions, they must use an EZAP such as the one described in AC120-XX, ''Program to Enhance Aircraft Electrical Wiring Interconnection System Maintenance'' to perform a review of their representative airplane covering all areas, including the flightdeck (also known as the cockpit), electrical power center, fuel tank wiring and powerfeeder cables, as well as the engine. Applicants for design change approvals would have to perform a similar review for their proposed design changes.

A zonal analysis procedure is an assessment of the structures and systems within each physical zone of the airplane. It is used to develop an inspection program to assess the general condition and security of attachment of all system components and structures items contained in the zone, using general visual inspections (GVI). An enhanced zonal analysis procedure

(EZAP) is an enhanced version of the zonal analysis procedure. It focuses on EWIS components. An EZAP-generated inspection program might call for the use of stand-alone GVI and detailed inspections (DET). A stand-alone GVI is one that is performed separately from the regularly scheduled GVI (typically more frequently) and is focused on a particular area or component. In this case, the focus would be wiring. So while the zonal analysis procedure would result in a regularly scheduled GVI for the entire zone, in which each of its systems and structures are inspected at the same time, the EZAP could result in additional GVIs or DETs for the EWIS in that zone, which occur more frequently. These inspection techniques are discussed later in this section.

An EZAP identifies the physical and environmental conditions contained in each zone of an airplane, analyzes their effects on electrical wiring, and assesses the possibilities for smoke and fire. From such an analysis, maintenance tasks can be developed to prevent ignition sources and to minimize the possibilities for combustion by minimizing the accumulation of combustible materials. Such a procedure would involve dividing the airplane into physical areas, or zones, including actual physical boundaries such as wing spars, bulkheads, and cabin floor, and access provisions for the zone, and identifying which of those zones contain EWIS components. For those zones with EWIS components, characteristics and components of all systems installed in the zone would be listed. The EWIS in the zone would be described, including information on the full range of power levels carried in the zone. And the presence or possibilities for ignition sources or accumulation of combustibles would be noted.

Combustibles are any materials that could cause a fire to be sustained in the event of an ignition source. Examples of combustible materials would be dust or lint accumulation, contaminated insulation blankets, and fuel or other combustible liquids or vapors. Wire contaminants are foreign materials that are likely to cause degradation of wiring. Wire contaminants can also be combustibles. Some commonly used airplane liquids, like engine oils, hydraulic fluids, and corrosion prevention compounds, might be readily combustible, but only in vapor or mist form. In that case, an assessment must be made of conditions that could exist within the zone that would convert the liquid to that form. Combustibles appearing as a result of any single failure must be considered. An example would be leaks from connection sites of unshrouded pipes. For the purposes of this new requirement, the term combustible does not refer to material that will burn when subjected to a continuous source of heat as occurs when a fire develops. Combustibles, as used here, will sustain a fire without a continuous ignition source.

An EZAP must address:

- Ventilation conditions in the zone and the density of the installations that would affect the presence and build-up of combustibles and the possibilities for combustion. Avionics and instruments located in the flightdeck and equipment bays, which generate heat and have relatively tightly packed installations, require cooling air flow. The air blown into the area for that cooling tends to deposit dust and lint on the equipment and EWIS components.
- Liquid contamination on wiring. Most synthetic oils and hydraulic fluids, while they might not be combustibles by themselves, could be an aggravating factor for accumulation of dust or lint. This accumulation could then present fuel for fire. Moisture on wiring may increase the probability of arcing from small breaches in the insulation, which could cause a fire. Moisture on wires that contain insulation breaches can also lead to ''arc tracking.'' As discussed previously, arc tracking is a phenomenon in which an electrical arc forms a conductive carbon path across an insulating surface. The carbon path then provides a short circuit path through which current can flow. Short circuit current flow from arc tracking can lead to loss of multiple airplane systems, structural damage, and fire.
- EWIS in close proximity to both primary and back-up hydraulic, mechanical, or electrical flight controls.
- The type of wiring discrepancies that must be addressed if they are identified by general visual or detailed inspections. A listing of typical wiring discrepancies that should be detectable during EZAP-derived EWIS inspections is given in AC120-XXX, Section B ''Guidance for Zonal Inspections.''
- Proper cleaning methods for EWIS components.

Once information about such contaminants and combustibles within an airplane zone is collected, each identified possibility for combustion would then be addressed to determine whether a specific task could be performed to reduce that possibility. An example of a specific task to reduce build-up of combustibles on EWIS components is the use of temporary protective covers (such as plastic sheeting) over EWIS components in a zone where corrosion prevention fluids are being used. This would minimize the amount of fluid contamination of the EWIS components. Preventing fluid contamination reduces the probability of other contaminants, like dust and dirt, accumulating on the EWIS components. If no task can be developed to prevent accumulation of combustibles in a zone, such as the dust blown through the air by cooler fans, then tasks must be developed to minimize their buildup, such as scheduled cleaning.

Developing an ICA to define such tasks would include assessing whether particular methods of cleaning would actually damage the EWIS components. Although regular cleaning to prevent potential combustible build-up would be the most obvious task for an EWIS ICA, other procedures might also be called for. A detailed inspection of a hydraulic pipe might be appropriate, for instance, if high-pressure mist from a pinhole caused by corrosion could accumulate on a wire bundle in a low ventilation area, creating a possibility for electrical arcing.

Proximity of EWIS to both primary and back-up hydraulic, mechanical, or electrical flight controls within a zone would affect the criticality of inspections needed, their level of detail, and their frequency. Even in the absence of combustible material, wire arcing could adversely affect continued safe flight and landing if hydraulic pipes, mechanical cables, or wiring for fly-by-wire controls are routed close to other wiring.

The EZAP-generated ICA must be produced in the form of a single document, easily recognizable as EWIS ICA for that specific airplane model. The single document is relevant to the maintenance and inspection aspects of the ICA, and not the standard wiring practices manual or electrical load analysis, etc.

The ICA must define applicable and effective tasks, and the intervals for performing them, to:

- Minimize accumulation of combustible materials.
- Detect wire contaminants.
- Detect wiring discrepancies that may not otherwise be reliably detected by inspections contained in existing maintenance programs.

As noted earlier, among the types of tasks to be developed from an EZAP are general visual inspections (GVI) and detailed inspections (DET). A GVI is defined as a visual examination of an interior or exterior area, installation, or assembly to detect obvious damage, failure, or irregularity. This level of inspection is made from within touching distance of the inspected

object unless otherwise specified. It is made under normally available lighting conditions such as daylight, hangar lighting, flashlight, or droplight and may require removal or opening of access panels or doors. It may be necessary to use a mirror to improve visual access to all exposed surfaces in the inspection area. Stands, ladders, or platforms may be required to gain proximity to the area being checked. It is expected that the area to be inspected is clean enough to minimize the possibility that accumulated dirt, grease, or other contaminants might hide unsatisfactory conditions that would otherwise be obvious. It is also expected, as an outcome of the EZAP applied to EWIS, that any cleaning considered necessary would be performed in accordance with procedures that minimize the possibility of the cleaning process itself introducing anomalies. The EZAP must identify guidelines to assist personnel performing a GVI in identifying wiring discrepancies and in assessing what effect such discrepancies, if found, could have on adjacent systems, particularly if these include wiring. As discussed previously, a list of typical wiring discrepancies that should be addressed is contained in proposed AC120–XX, Section B, ''Guidance for Zonal Inspections.''

A DET is an intensive examination of a specific item, installation, or assembly to detect damage, failure, or irregularity. Available lighting is normally supplemented with a direct source of good lighting at an intensity considered appropriate. Inspection aids, such as mirrors, magnifying lenses, or other means, may be necessary. Surface cleaning and elaborate access procedures may be required. A DET can be more than just a visual inspection. It may include tactile assessment to check a component or assembly for tightness and security. Such an inspection may be needed to ensure the continued integrity of installations such as bonding jumpers, terminal connectors, etc.

A DET would be required when the developer of the EZAP determines that a GVI is inadequate to reliably detect anomalies or degradation of EWIS components. Any detected discrepancies must be corrected according to the operator's approved maintenance procedures. It is not intended that the EZAP ICA identify how to correct detected discrepancies.

To prevent improper modification and repair of existing EWIS or the improper installation of a new EWIS, modification designers and modification personnel must know the applicable standard wiring practices, EWIS identification requirements, and electrical load data for the airplane undergoing modification. The proposed Appendix H 25.5 would also require that the following information be included in ICA applicable to EWIS:

- Standard wiring practices data.
- Wire separation design guidelines.
- Information to explain the airplane's EWIS identification method required by the proposed § 25.1711.
- Electrical load data and instructions for updating that data. Such information will help ensure that those modifying, repairing, or installing new EWIS will not perform any action that will adversely affect previously certified systems and unintentionally introduce potential hazards.

Standard wiring practices are defined as standards developed by the specific airplane manufacturer or industry-wide standards for the repair and maintenance of EWIS. They include procedures and practices for the installation, repair, and removal of EWIS components, including information about wire splices, methods of bundle attachment, connectors and electrical terminal connections, bonding, and grounding. Although a standard wiring practices manual is not a design manual, and those designing a new EWIS modification for a specific model airplane should not use it as such, it does provide the designer with insight into the types of EWIS components used by the TC holder and the procedures recommended by the manufacturer for maintenance or repair that supports continued airworthiness of the components.

EWIS separation guidelines are important for maintaining the safe operation of the airplane. Maintenance and repair personnel need to be aware of the type certificate holders' separation requirements so they do not compromise separation in previously certified systems. In fuel tank systems, the separation of certain wires may be critical design configuration control items and therefore qualify as an airworthiness limitation. Maintenance personnel need to be aware of these guidelines and limitations because many times wire bundles must be moved or removed to perform necessary maintenance. They must be able to readily identify EWIS associated with systems essential to the safe operation of the airplane.

Similarly, those who design and install new EWIS need to be aware of separation requirements so they can use the same methods to develop the required separation for the EWIS they are adding to the airplane. This would help to ensure both that newly added EWIS is adequately separated from other EWIS, airplane system components, and structure so they do not damage the added EWIS, and that the addition of the new EWIS does not invalidate separation for previously certified EWIS.

Electrical load data and the instructions for updating that data are necessary to help ensure that future modifications or additions of equipment that consume electrical power do not exceed the generating capacity of the onboard electrical generation and distribution system. The existing § 25.1351(a)(1) mandates that the required generating capacity, and the number and kinds of power sources, must be determined by an electrical load analysis. Typically, after an airplane is delivered and enters service, it is modified numerous times throughout its service life. Each addition or deletion of an electrical-power-consuming system changes the electrical load requirements. The only way to ensure that the capacity of the overall generating and distribution system, as well as individual electrical buses, is not exceeded is to have an up-to-date electrical load analysis. The best way to ensure that an up-to-date electrical load analysis is maintained is for the type certificate holder to include such data in the ICA provided with the airplane when it is first delivered to a customer, along with recommended practices for keeping it updated as electrical loads are deleted and added.

D. Part 25 Electrical System Harmonization Rules

At the time the EWIS certification requirements contained in this proposal were being developed, several existing part 25 certification requirements were also undergoing revision under a separate joint harmonization effort with the European JAA. The FAA had tasked ARAC to develop recommendations for harmonized rules (64 FR 66522). The intent of that harmonization effort was to develop a common set of standards between 14 CFR part 25 and JAR–25. As mentioned previously, JAR–25 is the European counterpart to part 25.

When ATSRAC began developing the EWIS requirements proposed in this NPRM, the process of developing harmonized proposals was essentially complete, although NPRMs had not yet been published in the **Federal Register**. So ATSRAC worked on the assumption that the harmonized rules would be in effect by the time this proposal was published, and used the new proposed harmonized part 25 as the baseline for the proposed EWIS requirements. This NPRM revises several of the harmonized

rules to accommodate the proposed new EWIS requirements.

Three of those harmonized part 25 proposals, § 25.869(a), § 25.1353(a), (c)(5), (c)(6), (d), and § 25.1431(d), have already been adopted as final rules (69 FR 12526). We're revising the new 25.1353(a) in this NPRM. Some of the remaining harmonized rules have been published as NPRMs. But several others have not. Therefore, to ensure consistency in the proposed EWIS requirements, those harmonized requirements on which ATSRAC recommendations are based, and which have not yet been published as final rules, are included in this NPRM. These are: §§ 25.899, 25.1309, 25.1310, 25.1357, 25.1360, 25.1362, and 25.1365.

The following discusses the proposed harmonization rules that must be adopted to support the addition of the proposed part 25 EWIS certification requirements. We believe the public should be aware of the background and full reasoning behind each change to these standards.

Section 25.899 Electrical Bonding and Protection Against Static Electricity

Proposed § 25.899 would contain requirements for electrical bonding and protection against static electricity. Current §§ 25.581, 25.954, and 25.1316 contain requirements for protecting the airplane and its systems from the effects of lightning strikes. But the current requirements do not address the hazards that could occur because of the accumulation of electrostatic charge. Static electricity can cause electrical shock hazards to people, ignite fuel vapors, and cause electromagnetic interference of airplane systems. Proposed § 25.899 would require that electrical bonding and protection against static electricity be designed to minimize accumulation of electrostatic charge that could cause human injury from electric shock, ignition of flammable vapors, or interference with electrical and electronic equipment. Compliance could be shown by bonding the components properly to the airframe or by incorporating other acceptable means to dissipate static charge.

This proposal would adopt a modified version of the current proposed JAR 25X899. As currently written, the JAR duplicates some of the lightning protection requirements of JARs 25.581, 25.985, and 25.1316. That proposed JAR 25X899 will be revised as well, and those duplications removed, for the purposes of this harmonization.

There is currently no § 25.899. This new requirement is necessary to ensure electrical bonding and static protection is fully addressed as a design standard. Proposed § 25.899 maintains the same level of safety as currently exists because it reflects and codifies current industry practices. The proposed change would affect airplane manufacturers by requiring compliance with the new sections of the regulations. However, this would have a minimal effect in practice because airframe manufacturers must comply with proposed standards when seeking joint FAA–JAA certification of their products, so there would be little change required from the standards they have been using to comply with the existing proposed JAR 25X899.

The FAA has developed advisory material about the requirements for bonding and static electricity protection in transport category airplanes. This material is contained in proposed AC 25.899–1.

Section 25.1309 Equipment, Systems, and Installations and Section 25.1310 Power Source Capacity and Distribution.

Proposed new § 25.1310 is composed of material now covered in § 25.1309(e) and (f). The current standards define an ''essential load'' on the power supply and the conditions under which those loads must be supplied. An ''essential load'' is each equipment installation whose function is required for type certification or by operating rules and that requires a power supply. These paragraphs require that power sources must be able to supply those loads under a number of specified failure conditions. These requirements are not directly related to the safety and analysis requirements of § 25.1309. For that reason, and to make them more accessible, we propose to move them to a new section where they would stand alone. There is no current § 25.1310.

The goal of harmonization was to ''envelope'' to the more stringent requirements, which in this case are those contained in the current § 25.1309(e) and (f). The proposal is to adopt as § 25.1310 the more stringent current § 25.1309(e) and (f). The JAA has agreed to adopt the same requirements in a new JAR 25.1310 (JAR NPA25df-317). Current § 25.1309(g) would be redesignated as § 25.1309(e). The proposed new § 25.1310 and JAR 25.1310 would not be completely harmonized because JAR 25.1310 contains requirements for maintenance of airworthiness essential services after failure of any two engines on a three-engined airplane and makes reference to two JAR Advisory Circular Joint materials (ACJ). But the proposed standard maintains the same level of safety as the current regulations. It is in line with current design practices and will have a minimum effect on the airplane operators and manufacturers.

There is no current published FAA advisory material for the proposed rule. ARAC has recommended that the JAR ACJ to 25.1310(a) be adopted as FAA advisory material because it provides a useful, acceptable means of compliance. The FAA plans to adopt it.

Section 25.1357 Circuit Protective Devices

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 propose to revise § 25.1357 to move the spare fuse requirement of paragraph (f) to paragraph (d) to harmonize with the JAR requirement.

The proposed standard continues to 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. It would maintain the same level of safety relative to the current regulations and is in line with current industry practice.

Manufacturers and operators of transport category airplanes could be affected by the proposed change. But since it is in line with current industry practice and does not result in any practical changes in requirements or practice, such effects would not be significant.

The JAR paragraph 25.1357(a) references advisory material, ACJ 25.1357(a), which states that the effects of variations in ambient temperatures on either the protective device or the equipment it protects must not result in hazards. We intend to revise our current AC 25–1357 to include this ACJ material. The announcement of a new AC on the effects of temperature variations will be published in the **Federal Register** once it is available to the public. Comments on the proposed AC will be invited in that notice.

Section 25.1360 Precautions Against Injury

Also to harmonize with the standards of JAR, the FAA proposes to add a new section, § 25.1360, concerning electric

shock and burn protection. Currently, there is no part 25 requirement for precautions against injury from electrical shock and burns. Adding the JAR requirement to part 25 would increase safety. The proposed JAR 25X1360, with its related ACJ material, would require that the electrical system and equipment must be designed to minimize risk of electrical shock and burns to the crew, passengers, and maintenance and servicing personnel during normal operations. The ACJ provides advisory material for high voltages and high temperatures and a means of compliance to the requirements.

The proposed action is to harmonize the regulations by the adoption of JAR 25X1360 and its ACJ material in its entirety. The proposed standard is more stringent for part 25 because it adds a new requirement and new advisory material. But it is in line with current industry practice, and therefore would maintain the level of safety.

The FAA intends to publish advisory material that adopts the existing JAA advisory material.

Section 25.1362 Electrical Supplies for Emergency Conditions.

The FAA proposes to add a new section, § 25.1362, about electrical supplies for emergency conditions. There is no part 25 standard addressing electrical supplies for emergency conditions equivalent to JAR 25.1362. Partial coverage is provided by §§ 25.1189, 25.1195, 25.1309, and 25.1585.

The JAR 25.1362 and associated ACJ material were created to ensure that electrical supplies for emergency functions (such as fuel and hydraulic shut-off valves) are maintained so they are operable after the flight crew has switched off the main power sources. This is necessary so emergency procedures can be performed. Since there is no equivalent standard to JAR 25.1362 in part 25, but partial coverage is provided by §§ 25.1189, 25.1195, 25.1309, and 25.1585, application of JAA standards by U.S. manufacturers and aircraft operators has sometimes resulted in different designs for the powering of appropriate emergency functions.

The proposed action would adopt a new § 25.1362 harmonized to a revised JAR 25.1362. The new harmonized standard would provide for a consistent application of the standards. The ACJ would be revised and adopted as a new AC by the FAA. This proposed rule and advisory material would provide flexibility by allowing either an appropriate airplane flight manual (AFM) procedure or design implementation to achieve compliance with the standards.

This proposal addresses the underlying safety issue by ensuring that appropriate electrical power supplies are maintained to emergency services after the main power sources have been switched off by the flightcrew. The proposal increases the level of safety by focusing on appropriate methods to ensure that electrical power is provided for emergency functions during emergency landing or ditching conditions. It is in line with current industry practice. Another option considered was to adopt the existing JAR and ACJ into 14 CFR. But revising the JAR and the ACJ material and creating a new § 25.1362 and AC 25–1362 results in a harmonized standard that would provide greater flexibility for compliance.

Since this proposed change is in line with current design practices, the effect is considered to be minimal for aircraft operators and manufacturers affected by this change.

There is no FAA advisory material available. This proposal would create a new AC 25–1362 harmonized with ACJ 25X1362.

Section 25.1365 Electrical Appliances, Motors, and Transformers

The FAA proposes to add a new section, § 25.1365, within the ''Miscellaneous Equipment'' section of subpart F, concerning design and installation of domestic appliances. 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. In turn, domestic systems are those such as lavatories or galleys, that may contain one or more domestic appliances. IFE equipment, however, is not considered equipment that falls under the definition of a domestic appliance. Proposed § 25.1365 is now covered by § 25.1309(b), which does not specifically address electrical appliance motors and transformers.

The proposed § 25.1365 would require 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 would further require 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 would also require that 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 the requirements of § 25.1309(b).

Adoption of the proposal would address concerns that faulty galley heating equipment (ovens) often cause smoke or fire in the cabin, and that circuit protection devices used in motor power supplies for those appliances have not always provided enough protection against failures.

The proposed standard would be an improvement over current safety practices because current part 25 does not specifically address electrical appliance motors and transformers. The FAA considers that a new § 25.1365 specifically addressing domestic appliances is the most appropriate way to increase the level of safety. The JAA is adopting the same requirement as JAR 25.1365.

Aircraft operators and manufacturers, together with suppliers of galley and electrical equipment, could be affected by this change. Since newly certificated aircraft may have to be supplied with newly designed galley equipment, airplane operators may elect to introduce the same new equipment into their existing fleet to maintain fleet commonality.

A new AC 25–1365 will be developed and an announcement of its availability for comment will be published in the **Federal Register**.

E. Proposed Changes to Part 91, 121, 125, and 129 Operating Rules for Fuel Tank Systems and EWIS and Other Existing Continued-Airworthiness-Related Rules

As discussed earlier, the proposed alignment of the ICA requirements for EWIS and the fuel tank system is a result of an FAA review and realignment of the Aging Airplane Program. We have determined that certain compliance dates in the existing rules and pending proposals could be better aligned. Other changes to the rules and proposals are necessary to increase the cost-effectiveness of these rules and proposals. Therefore, we have decided to revise those requirements and proposals and to align the compliance schedules as nearly as possible. This effort also includes a proposal to create new subparts in parts 25 (subpart I, discussed earlier), 91, 121, 125, and 129. These new subparts would contain certain rules in this proposal and other existing and future rules that pertain to the support of

continued airworthiness, in particular, rules addressing aging airplane issues. 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 table below illustrates what proposed and existing requirements will be included in these new subparts. Each of these new subparts is titled ''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.

NEW CONTINUED AIRWORTHINESS SUBPARTS FOR PARTS 25, 91, 121, 125, AND 129

Part 25 new/relocated rules within proposed Subpart I	Part 91 new/relocated rules within proposed Subpart L	Part 121 new/relocated rules within proposed Subpart Y	Part 125 new/relocated rules within proposed Subpart M	Part 129 new/relocated rules within proposed Subpart B
§ 25.1801—Purpose and definition (new).	§ 91.1501—Purpose and definition (new).	§ 121.901—Purpose and definition (new).	§ 125.501—Purpose and definition (new).	(Proposed Subpart A would contain a revised § 129.1 and all of existing part 129 except §§ 129.16, 129.32, and 129.33).
§ 25.1803—Reserved	§ 91.1503—Reserved	§ 121.903—Reserved	§ 125.503—Reserved	§ 129.101—Purpose and definition (new).
§ 25.1805—Electrical wiring interconnection systems (EWIS) maintenance program (new).	§ 91.1505—Repairs assessment for pressurized fuselages (formerly § 91.410(a)).	§ 121.905—Aging airplane inspections and records reviews (formerly § 121.368).	§ 125.505—Repairs assessment for pressurized fuselages (formerly § 125.248(a)).	§ 129.103—Reserved.
	§ 91.1507—Fuel tank system maintenance program (new) (replaces requirements of § 91.410(b)).	§ 121.907—Repairs assessment for pressurized fuselages (formerly § 121.370(a)).	§ 125.507—Fuel tank system inspection program (new) (replaces requirements of § 125.248(b)).	§ 129.105—Aging airplane inspections and records reviews for U.S.-registered multiengine aircraft (formerly § 129.33).
		§ 121.909—Supplemental inspections (formerly § 121.370a).	.....	§ 129.107—Repairs assessment for pressurized fuselages (formerly § 129.32(a)).
		§ 121.911—Electrical wiring interconnection systems (EWIS) maintenance program (new).	.....	§ 129.109—Supplemental inspections for U.S.-registered aircraft (formerly § 129.16).
		§ 121.913—Fuel tank system maintenance program (new) (replaces requirements of § 121.370(b)).	.....	§ 129.111—Electrical wiring interconnection systems (EWIS) maintenance program (new).
				§ 129.113—Fuel tank system maintenance program (new) (replaces requirements of § 129.32(b)).

As previously stated, other future rules pertaining to the support of continued airworthiness would also be contained in these proposed new subparts. Several such proposals are currently under development. But because of uncertainties in the timing of adoption of final rules, it is not always possible to estimate which of the proposals currently being developed will reach final rule stage first. In order to ensure that the proposed new subparts for continued airworthiness have been established in 14 CFR to contain whichever of several new continuing airworthiness proposals is adopted, the FAA has decided to use a ''building block'' strategy to establish the new subparts.

Until the new subparts have been established in 14 CFR as part of a final rule, each of several proposals containing new continued airworthiness rules will include language needed to set up the proposed subparts. Once one of those proposals becomes final, and the new continued airworthiness subparts are thus established, then other continued-airworthiness-related proposals will delete any language relating to setting up the new subparts. They will retain only the rule language pertinent to that specific proposal.

A result of this ''building block'' strategy of proposed rulemaking is the possibility that two or more NPRMs may appear in the **Federal Register** proposing the same new continued airworthiness subparts for 14 CFR at the same time. The language setting up the operational rule subparts will be the same in each rulemaking. But the language setting up subpart I of part 25 will vary slightly because of differences in the applicability of each rule. The proposed applicability in proposed §§ 25.1 and 25.1801 will be correct for each NPRM. Otherwise, commenters addressing each NPRM might be confused by an inconsistency between the applicability of the subpart and the applicability of the individual proposed rule sections. And until final decisions are made on the content of each later NPRM, it would be inappropriate and potentially misleading for this NPRM to propose that content.

If this NPRM, which has the narrowest applicability of several

proposals in development, is adopted first, then as each of the other final rules is adopted, §§ 25.1 and 25.1801 would be amended to expand the applicability to cover what's added in the new rule. For instance, one proposal might cover holders of existing supplemental type certificates (STCs), so § 25.1 and § 25.1801, as adopted in this NPRM, would be amended to reference those holders. If a proposal applying to them is adopted first, then when this proposal is adopted, we can remove the proposed § 25.1 and § 25.1801 from the final rule, because those provisions would already be included in the previously adopted rule.

When all the proposals currently under development are issued as final rules, § 25.1 and § 25.1801 will be as broad as they need to be to cover all of the rules. If any of those rules currently under development is not issued, then those sections would be only as broad as is needed for the rules that are adopted. Because the language in each NPRM will have been appropriate for that specific NPRM, the public will have been given adequate notice for all of the provisions in the final versions of those sections.

Paragraph (a) of the ''Purpose and definition'' sections of part 91, subpart L, part 121, subpart Y, part 125, subpart M, and part 129, subpart B generally describes the applicability of these subparts and states that the purpose of the various sections in these subparts is to prescribe requirements to support continued airworthiness. While most of the requirements of these subparts would address the need for improved maintenance, these subparts may also include requirements to modify airplanes or take other actions that we consider necessary for continued airworthiness.

Historically, the only means used by the FAA to impose these types of requirements was the AD process. Under part 39, ADs address unsafe conditions that we determine are likely to exist or develop on other products of the same type design. In recent years, the FAA has identified a number of fleet-wide continued airworthiness issues, particularly relating to aging airplanes, that are not limited to particular type designs. Under these circumstances, general rulemaking may be a more efficient and appropriate way to address these types of problems than ADs. These new subparts provide locations for these types of requirements.

Paragraph (b) of these sections provides a definition of the term ''FAA Oversight Office.'' As stated in the discussion of proposed § 25.1801, 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. As discussed previously, the primary means for operators to comply with the requirements of these subparts would be by implementing programs or taking other actions developed by the TC and STC holders under proposed subpart I of part 25. In each case, to ensure compliance with the relevant subpart I rule, the TC and STC holder deliverables must be approved by the FAA Oversight Office. Because we expect this will be a standard approach to compliance with the requirements of these subparts, we are including this definition in these sections to avoid having to repeat it in each section within these subparts.

Proposed Changes to Parts 121 (Subpart Y) and 129 (Subpart B)—EWIS Maintenance Programs

Paragraph (a) states that these sections would apply to transport category, turbine powered airplanes with a maximum type certificated passenger capacity of 30 or more, or having a maximum payload capacity of 7500 pounds or more resulting from the original certification of the airplane or later increase in capacity. This applicability provision coincides with that of proposed § 25.1805 and is intended to ensure that, if a TC or STC holder is required to develop EWIS ICA for an airplane design, the operator of that airplane is required to implement them. As discussed previously, certain vintage airplanes would be excluded from these requirements. This applicability would result in the coverage of airplanes where the safety benefits and the public interest are the greatest. This action would affect approximately 7,000 U.S. registered airplanes in parts 121 and 129 operations.

Paragraph (b) of these sections would add requirements for maintenance programs for EWIS for part 121 certificate holders and part 129 foreign air carriers and foreign operators of U.S. registered aircraft. Paragraph (c) would require them to develop a maintenance program for EWIS based on ICA for EWIS prepared by TC or STC holders. As discussed previously, the changes to part 25 would require both holders of existing TCs and future applicants for TCs and design changes to provide affected operators with these ICA.

The compliance date for adopting these maintenance program changes is December 16, 2008. Assuming this proposal is adopted by mid-2006, this proposal would give operators 30 months after the effective date of the final rule to make these changes. Because the proposed compliance date in § 25.1805 for holders of existing TCs is December 16, 2007, operators would have one year after that date to comply with this section.

For pending and future design changes approved after December 16, 2008, operators incorporating such a change would have to revise their maintenance program to incorporate EWIS ICA before returning the airplane to service.

Paragraph (d) would require that operators keep their EWIS maintenance programs current as they modify their airplanes. As discussed earlier, the proposed changes to part 25 would ensure that, for modifications affecting EWIS, the applicant for the design approval will provide necessary revisions to the ICA. This paragraph would ensure that operators installing those modifications on their airplanes would revise their maintenance program to incorporate these ICA revisions.

Paragraph (e) would require that the maintenance program changes required by these sections be approved by the operator's principal inspector. We are in the process of developing guidance for principal inspectors to ensure that their reviews are consistent and focused on the key implementation issues.

Assuming this proposal is adopted by mid-2006, this proposal would give the affected air carriers and operators 30 months after the effective date of the final rule to incorporate those ICA for EWIS into their manuals. Thereafter, inspections and maintenance of EWIS and fuel tank systems must be carried out at the intervals specified in the operator's maintenance program.

Many problems caused by inadequate wire maintenance practices have been discussed previously in this document. Much effort has been devoted to identifying the maintenance practices that could either prevent such incidents and accidents from occurring again or mitigate their causes. The purpose of this new section is to ensure that enhanced EWIS and fuel tank system maintenance techniques are put into practice on a continuing basis in airplane maintenance programs. Proper use of existing methods, techniques, and practices, combined with knowledge gained through ATSRAC activities, service history, research, and analysis, will result in improved wire system safety.

Proposed Changes to Parts 91 (Subpart L), 121 (Subpart Y), 125 (Subpart M), and 129 (Subpart B)—Fuel Tank Maintenance Programs

These proposals would require part 91 and part 125 operators, part 121 certificate holders, and part 129 foreign air carriers and foreign persons operating U.S. registered airplanes to incorporate fuel tank system ICA into their inspection or maintenance programs. As discussed earlier, one of the main objectives of this rulemaking is to align the operational requirements for fuel tank maintenance programs with the proposed requirements for EWIS maintenance programs. To that end, except as discussed below, the current fuel tank requirements would be revised to be parallel with the EWIS operational requirements discussed earlier. We provide the justification for these parallel provisions in the earlier discussion of the EWIS proposal, and it is not repeated here.

Part 91 and part 125 operators are required to have an inspection program. Part 121 air carriers are required to have an inspection program and a program covering maintenance, preventive maintenance, and alterations for their airplanes. As provided by § 43.13(a), operators may choose to follow the maintenance instructions developed by the TC holder or they may develop their own maintenance instructions, as long as they are acceptable to the Administrator. But they must comply with the airworthiness limitations section of the ICA. Foreign persons or foreign air carriers operating a U.S. registered aircraft are required to have a maintenance program approved by the Administrator.

Because of the Fuel Tank Safety Rule, the above-listed operators and air carriers must now incorporate instructions for inspection and maintenance of the fuel tank system into their inspection or maintenance programs. These instructions must address the actual configuration of the fuel tank systems and they must be approved by the FAA aircraft certification office (ACO) having cognizance over the TC for the affected airplane. The compliance time for incorporation of the fuel tank system instructions for inspection and maintenance into the inspection or maintenance programs was changed on July 30, 2004 to December 16, 2008. The reasons for that change were briefly outlined earlier in this document in the discussions about rule alignment. This proposal would change the current requirements for the instructions for fuel tank inspections and maintenance that must be incorporated into operators' and air carriers' inspection or maintenance programs in the following ways:

- The FAA Oversight Office must approve ICA for the fuel tank system, and the operator's principal inspector or Flight Standards District Office (FSDO) must approve the operator's program changes incorporating those ICA.

The current rule requires the ACO to approve individual operator fuel tank maintenance programs. The FAA recognizes that, as long as the ICA are approved by the ACO, ACO approval of the operators' maintenance program changes incorporating those ICA imposes unnecessary burdens on both the operators and the ACOs. With this proposed change, principal inspectors or the cognizant FSDO would be responsible for reviewing and approving program changes to address fuel tank safety. But, as stated, the ICA on which the operator's program is based must be approved by the FAA Oversight Office.

- The instructions for fuel tank maintenance and inspection developed by the TC holders will be referenced as the ''fuel tank ICA.'' The previous rule language referred to ''instructions for maintenance and inspection of the fuel tank system,'' even though it was widely understood throughout the industry that these instructions would be contained in the ICA. Because these requirements are now being aligned with the proposed requirements for EWIS to facilitate operator compliance, and the EWIS requirements refer to ICA as the place where EWIS maintenance instructions may be found, the FAA believes that using a consistent term to refer to the required information in both rules would clarify the common intent of the requirements and make them easier for operators to understand.
- The fuel tank ICA must address the fuel tank system as defined by the airplane's TC, any supplemental TCs, and any field approved incorporated auxiliary fuel tank systems. The current requirements mandate that the ICA must be developed for the ''actual configuration of the fuel tank systems of each affected airplane.'' That wording, however, proved to be unclear to many in the industry. The changed language is proposed to clarify the original intent.

To further clarify what STCs should be included, the FAA has created a list by airplane model of STCs affected by this proposed rule. That list has been placed in the docket for this rulemaking and may also be viewed at *http://qps.airweb.faa.gov/QuickPlace/sfar88ops/Main.nsf.*

The holders of those STCs, as well as the TC holders for the affected airplane models, must develop the ICA as required by SFAR 88. We are also proposing to make it clear that the operator is required to develop the maintenance instructions for field-approved auxiliary fuel tanks. Because there is no other design approval holder for these tanks, there is no other person in a better position to develop these instructions. As with the original requirements of the Fuel Tank Safety Rule, we expect that operators who do not have the expertise to develop these instructions will be able to contract with experts to help them.

The proposed operational rules also make it clear that they apply to ICA developed under SFAR 88, to ICA developed for new or amended certificates under § 25.1529 Amendment 102, and to any later revisions to those ICA. These proposed operational rules would require that operators revise their maintenance and inspection programs to incorporate ICA changes associated with alterations affecting the fuel tank ICA. This is necessary because an alteration may invalidate existing fuel tank system ICA, and compromise the safety objectives of the proposed rules.

H. Advisory Circulars

As indicated in the discussion of ATSRAC recommendations that appeared earlier in this document, the advisory committee has produced four guidance documents as products of the working group activities that have contributed to this proposed rule. Those guidance documents are on maintenance, training, and standard wiring practices manuals, as well as on the proposed new subpart H. We have used these documents as the basis for developing the accompanying advisory circulars. Notices of availability for comment for the training, standard wiring practices, and subpart H ACs are published elsewhere in the **Federal Register**. Notice of availability for the maintenance AC will be published as soon as possible.

Advisory materials for the design approval holder (DAH) requirements of subpart I and for the part 25 electrical system harmonization rules are also made available in notices of availability for comment published elsewhere in the **Federal Register**.

In addition, guidance material entitled ''Process for Developing Instructions for Maintenance and Inspection of Fuel Tank Systems Required by SFAR 88'' was made available as a policy statement on May 28, 2004 at *http://www.airweb.faa.gov/rgl.* Comments have been received and are being reviewed. Advisory Circular 25.981–1B, ''Fuel Tank Ignition Source

Prevention Guidelines,'' gives guidance on showing compliance to certification requirements for prevention of ignition sources within the fuel tanks of transport category airplanes. It also gives guidance on developing ICA for fuel tank systems. It can be found in the docket for this NPRM.

VI. Regulatory Analyses and Notices

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 that are necessary for safety for the design, production, operation, and maintenance of those airplanes, and for other practices, methods and procedures relating to those airplanes.

Paperwork Reduction Act

This proposal contains the following new information collection requirements. As required by the Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)), the Department of Transportation has submitted the information requirements associated with this proposal to the Office of Management and Budget for its review.

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

Summary: This proposal consists of regulatory changes applying to wiring systems and fuel tank systems in transport category airplanes. Some of those changes would require new information collection. The proposed new information requirements and the persons who would be required to provide that information are described below.

Required Information, Use, and Respondents

(1) Proposed § 25.1711 would require 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 would also include component part number, function, and separation requirements for bundles. This specificity of labeling would 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 would 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 would bear the burden of this labeling requirement.

(2) Proposed § 25.1805 would require that existing TC holders develop Instructions for Continued Airworthiness (ICA) for EWIS. Applicants for approval of design changes would be required to develop revisions to those EWIS ICA for any modifications to the airplane that might affect them. Proposed § 25.1739 and Appendix H would apply the requirement for EWIS ICA to future applicants for TCs. EWIS ICA would be used by operators to prepare their maintenance programs. This requirement would be necessary to ensure that wiring is properly maintained and inspected to avoid problems that could affect safety.

(3) Proposed subpart I would also require that TC holders submit to the FAA a plan detailing how they intend to comply with its requirements. This information would be used by the FAA to assist the TC holder in complying with requirements. The compliance plan would be necessary to ensure that TC holders fully understand the requirements, correct any deficiencies in planning in a timely manner, and are able to provide the information needed by the operators for the operators' timely compliance with the rule.

(4) Anyone operating an airplane under part 121 would be required to revise their existing maintenance program to incorporate the maintenance and inspection tasks for EWIS contained in the EWIS ICA required by subpart I. The information incorporated into the maintenance program would be used by maintenance personnel to maintain the integrity of airplane wiring systems. This requirement would be 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 would 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 NPRM 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 proposals for revised maintenance programs for EWIS included in this NPRM, certificate holders would 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 proposed revision to part 25 Appendix H would require that future manufacturers include acceptable EWIS practices in their ICA, presented in a standard format. This information would 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 proposal, manufacturers would change their Standard Wiring Practices Manuals (SWPM).

Annual Burden Estimate

To provide estimates for the burden associated with this NPRM, the FAA developed categories corresponding to information collection impacts of requirements contained in the proposal. The summary table below contains the impacted entities, average annual hours and hardware costs, and the corresponding average annual cost. Details of the estimates are in the paragraphs below.

Entities impacted	Proposed requirement	Hardware cost	Average annual hours	Average annual cost
Airplane Manufacturers	Wire identification (30 seconds per label)		12,046	$430,524
Airplane Manufacturers	Label	5 cents per label		72,275
Airplane Modifiers	Wire identification (30 seconds per label)		18,417	658,224
Airplane Modifiers	Label	5 cents per label		110,500
Existing TC Holders	Develop ICA		15,743	868,699
Future TC Applicants	Develop ICA		3,578	197,434
Future STC Applicants	Develop ICA		57,828	3,190,949
Airplane Manufacturers	Revise SWPM		1,035	57,111
Airplane Manufacturers	Develop Compliance Plan		132	7,284
Airplane Operators	Revise Maintenance Program		2,744	151,414
Airplane Operators	Develop Training Program		2,376	131,108
Total			113,899	5,875,522

Proposed § 25.1711 would affect airplane manufacturers by requiring additional labeling. Over the 25-year period of analysis, manufacturers would label on average 413 airplanes yearly. The FAA estimates that an additional 3,500 labels might be added to wires in each part 25 airplane, for 1,445,500 labels annually. The additional identification requirement would take roughly 30 seconds, requiring approximately 12,046 annual hours. Using the fully burdened hourly cost of a mechanic ($35.74), the average annual hourly burden for the wire identification requirement on manufacturers is $430,524.

The estimated cost resulting from information collection from TC holders also considers the additional cost of labels. The additional manufacturer identification requirements would require roughly 1,445,500 labels annually. Industry representatives provided the FAA with cost estimates for each label of approximately 5 cents. The estimated annual corresponding cost is $72,275.

Section 25.1711 would also affect airplane modifiers when electrical wiring supplemental type certificates (STC) are installed on airplanes. The FAA estimates there would be an additional 200 labels added each time an affected STC is installed on an airplane. Using 170 as the average annual affected number of STCs, and 65 as the number of installations per STC, the corresponding total annual number of labels for STCs is 2,210,000. The identification requirement would take about 30 seconds for each additional label, requiring an annual burden of roughly 18,417 hours. Using the fully burdened hourly cost of a mechanic ($35.74), the annual burden on airplane modifiers for the wire identification requirement is $658,224.

Estimated costs resulting from information collection from STC applicants consider the additional cost of labels. The additional STC identification requirements would require roughly 2,210,000 labels annually. With the cost of each label approximately 5 cents, the estimated average annual corresponding cost is $110,500.

The proposal would require that existing TC holders develop ICA for EWIS. Over the period of analysis, the FAA estimates the proposal would require 15,743 average annual engineering hours, resulting in an average annual cost of $868,699 (using the fully burdened hourly rate of $55.18 for an engineer).

Proposed §25.1805 would also require future TC applicants to develop ICA for EWIS. The FAA estimates roughly .5 part 25 TCs yearly, with average annual estimated labor hours to perform the analysis of 3,578. This would result in average annual costs of $197,434.

The proposal would require future applicants for STCs to develop ICA for EWIS as well. Over the period of analysis, the FAA estimates it would take 948 annual STC applicants 61 hours to perform the analysis. With engineering costs of $55.18 per hour, the average annual burden would be $3,190,949.

Because of this proposal, manufacturers would change their Standard Wiring Practices Manual (SWPM). The FAA calculates 1,035 as the average annual hours required to update manuals, resulting in an average annual burden of roughly $57,111.

Manufacturers would present a plan for approval describing how they intend to comply with the requirements. The FAA believes the data contained in this plan would be submitted electronically with no cost to submit the plan. We estimate 60 labor hours (per airplane model) to develop a plan and submit data to the FAA. We estimate 3,300 hours for roughly 55 models. The average annual hours are 132, with corresponding average annual costs of $7,284 (using the fully burdened hourly cost of $55.18).

Operators would be required to revise their existing maintenance program to incorporate the maintenance and inspection tasks for EWIS contained in the EWIS ICA. Over the period of analysis, the FAA estimates 68,607 total hours, or 2,744 average annual hours required to revise existing maintenance programs. Using the fully burdened labor cost for an engineer, the average annual planning cost would be $151,414.

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 99 operators, the total hours would be 59,400 or 2,376 annually. Combined with the burdened hourly cost of $55.18, the average annual cost for training development would be $131,108.

The agency is soliciting comments to (1) evaluate whether the proposed collection of information is necessary for the proper performance of the functions of the agency, including whether the information will have practical utility; (2) evaluate the accuracy of the agency's estimate of the burden; (3) enhance the quality, utility, and clarity of the information to be collected; and (4) minimize the burden of the collection of information on those who are to respond, including through the use of appropriate automated, electronic, mechanical, or other technological collection techniques or other forms of information technology (for example, permitting electronic submission of responses).

Individuals and organizations may submit comments on the information collection requirement by December 5, 2005, and should direct them to the address listed in the **ADDRESSES** section of this document.

According to the regulations implementing the Paperwork Reduction

Act of 1995, (5 CFR Part 1320.8(b)(2)(vi)), an agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control number for this information collection will be published in the **Federal Register** after it is approved by the Office of Management and Budget.

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 proposed regulations.

Regulatory Evaluation Summary

This portion of the preamble summarizes the FAA's analysis of the economic impacts of this NPRM. It also includes summaries of the initial regulatory flexibility determination. We suggest readers seeking greater detail read the full regulatory evaluation, a copy of which we have placed in the docket for this rulemaking.

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

In conducting these analyses, FAA has determined this proposal: Has benefits that justify its costs, is not an economically ''significant regulatory action'' as defined in section 3(f) of Executive Order 12866, and is ''significant'' as defined in DOT's Regulatory Policies and Procedures; would not have a significant economic impact on a substantial number of small entities; would not have an effect on international trade; and would not impose an unfunded mandate on state, local, or tribal governments, or on the private sector. These analyses, available in the docket, are summarized below.

Total Costs and Benefits of This Rulemaking

The estimated cost of this NPRM is $474.4 million ($209.2 million present value) over 25 years. The total estimated benefits are $755.3 million ($340.7 million present value) over 25 years.

Who Is Potentially Affected by This Rulemaking?

- Manufacturers of part 25 airplanes.
- Operators of large transport category airplanes operating under FAR Parts 121 & 129.
- Applicants for amended type certificates and supplemental type certificates.

Cost Assumptions and Sources of Information

Discount rate—7%
Period of analysis—25 Years, 2005 through 2029
Burdened labor rate (as shown in key assumptions & labor rates in regulatory evaluation)—
- Aerospace engineers—$55.18/hour
- Maintenance personnel—$35.74/hour

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)
Fleet—FAA Flight Standards (SPAS Database)
Fleet Growth (3.82% per year) & Passenger Occupancy Rates (75%)—FAA Aerospace Forecasts Years 2003–2014
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

Wright, T.P. ''American Methods of Aircraft Production,'' 1939.
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*, 1992.
Irrgang, M.E., ''Airline Irregular Operations,'' *Handbook of Airline Economics*, 1995.

Alternatives We Considered

Alternative 1—Require operators to clean & inspect each airplane every C-check or every three years, causing an additional $192.5 million ($79.9 million present value) in cleaning and inspection costs, and an additional $104.0 million ($38.6 million present value) in downtime.

This option would result in additional costs of $296.5 million ($118.5 million present value) with no commensurate increase in benefits.

Alternative 2—Require EWIS training for four groups of people in addition to maintenance workers. The groups and additional costs are:

- Electrical/avionic engineers—$4.0 million ($2.4 million present value).
- Individuals involved in engineering or planning work—$0.4 million ($0.4 million present value).
- Flight deck crew—$260.0 million ($126.1 million present value).
- Cabin crew-$91.5 million ($44.4 million present value).

To train these individuals, operators would develop additional courses. The FAA estimates an additional $25.2 million ($24.1 million present value) to develop the necessary training material.

The total estimated additional cost of this alternative is approximately $381.1 million ($197.4 million present value) with no commensurate increase in benefits.

Benefits of This Rulemaking

The FAA estimates $755.3 million ($340.7 million present value) as the total benefits of this proposal.

In the table below, categories of benefits are shown. The middle column gives the nominal values of quantified benefits, while the right-hand column gives the total incremental present value benefits broken down by category type.

Benefits	Nominal values (millions)	Present value (millions)
Non Fatal & Fatal Accidents:		
Non Fatal events	$56.0	$26.1
Fatal events	507.0	236.3
Total	563.0	262.4
EWIS Operational Improvements:		
Averted delays	21.2	8.3
Averted unscheduled landings	152.4	62.4
Averted IFE failures	18.7	7.6
Total	192.3	78.3
Total—All Benefits	755.3	340.7

Costs of This Rulemaking

The FAA estimates $474.3 million ($209.2 million present value) as the total cost of this proposal.

In the table below, the left-hand column specifies the cost component by 14 CFR part, the middle column gives the nominal cost, and the right-hand column gives the total incremental present value costs by 14 CFR part.

Cost component	Nominal values (millions)	Present value (millions)
Part 25 Harmonization	0	0
Part 25 Subpart H	$131.9	$53.8
Part 25 Subpart I	23.3	20.3
Part 121 ICA	319.1	135.1
Parts 91/121/125—Fuel Tank	(*)	
Total	474.3	209.2

* *De minimus.*

Initial Regulatory Flexibility Determination

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

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

However, if an agency determines that a proposed or final rule is not expected to have a significant economic impact on a substantial number of small entities, section 605(b) of the 1980 RFA provides that the head of the agency may so certify and a regulatory flexibility analysis is not required. The certification must include a statement providing the factual basis for this determination, and the reasoning should be clear.

This proposed rule would not have a significant economic impact on a substantial number of small entities for the following reasons.

Entities potentially affected by this proposal include part 25 manufacturers, applicants for future amended and supplemental type certificates, and part 121 operators of large transport category airplanes.

The FAA uses the size standards from the Small Business Administration for Air Transportation and Aircraft Manufacturing, which specify companies having less than 1,500 employees as small entities.

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 would 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 supplemental type certificate (STC) applicants would incur additional compliance costs. These STC applicants would incur the cost only if the expected revenue from the STC would exceed the expected cost. While future STC costs would be passed on to airplane operators, it is not possible to determine when and which operator would purchase and install such a future STC. Because a future STC applicant would incur the additional compliance cost only if the STC would generate profits, the FAA believes there would not be a significant impact on a substantial number of STC applicants.

The FAA calculated the economic impact on small-business part 121 operators by dividing the annual compliance cost by the firm's annual revenue. The annual estimated average annual cost of the proposal would approach ½ of 1 percent for only two small entities. For the others, the cost impact would be a few hundredths of 1 percent of revenue.

The FAA has determined that: No part 25 manufacturers are small entities, there would not be a significant impact on a substantial number of amended TC or STC applicants, the estimated operator compliance cost as a percent of annual revenue would not be significant.

Accordingly, pursuant to the Regulatory Flexibility Act, 5 U.S.C. 605(b), the Federal Aviation Administration certifies that this proposed rule would not have a significant impact on a substantial number of small entities.

Initial International Trade Impact Assessment

The Trade Agreement Act of 1979 prohibits Federal agencies from establishing any standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. Legitimate domestic objectives, such as safety, are not considered unnecessary obstacles. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards. The FAA has assessed the potential effect of this proposed rule and determined that it would impose the same costs on domestic and international entities and, thus, would have a neutral trade impact.

Initial Unfunded Mandates Assessment

The Unfunded Mandates Reform Act of 1995 (the Act) is intended, among other things, to curb the practice of imposing unfunded Federal mandates on State, local, and tribal governments. Title II of the Act requires each Federal agency to prepare a written statement assessing the effects of any Federal mandate in a proposed or final agency rule that may result in an expenditure of $100 million or more (adjusted annually for inflation) in any one year by State, local, and tribal governments, in the aggregate, or by the private sector; such a mandate is deemed to be a ''significant regulatory action.'' The FAA currently uses an inflation-adjusted value of $120.7 million in lieu of $100 million. This proposed rule does not contain such a mandate. Therefore, the requirements of Title II of the Unfunded Mandates Reform Act of 1995 do not apply.

Executive Order 13132, Federalism

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

Plain English

Executive Order 12866 (58 FR 51735, Oct. 4, 1993) requires each agency to write regulations that are simple and easy to understand. We invite your comments on how to make these proposed regulations easier to understand, including answers to questions such as the following:

- Are the requirements in the proposed regulations clearly stated?
- Do the proposed regulations contain unnecessary technical language or jargon that interferes with their clarity?
- Would the regulations be easier to understand if they were divided into more (but shorter) sections?
- Is the description in the preamble helpful in understanding the proposed regulations?

Please send your comments to the address specified in the **ADDRESSES** section.

Environmental Analysis

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

Regulations That Significantly Affect Energy Supply, Distribution, or Use

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

The following Appendices will not appear in the Code of Federal Regulations.

Appendix A

List of Acronyms

AC—Advisory Circular
ACJ—Advisory Circular Joint
ACO—Aircraft certification office
AD—Airworthiness directive
AFM—Airplane flight manual
ARAC—Aviation Rulemaking Advisory Committee
ASTF—Aging Systems Task Force
ATA—Air Transport Association
ATSRAC—Aging Transport Systems Rulemaking Advisory Committee
CFR—Code of Federal Regulations
CS—Certification Specifications
CWT—Center wing fuel tank
DET—detailed inspection
EAPAS—Enhanced Airworthiness Program for Airplane Systems
EASA—European Aviation Safety Agency
EUROCAE—European Organization for Civil Aviation Equipment
EWIS—Electrical wiring interconnection systems
EZAP—Enhanced zonal analysis procedure
FAA—Federal Aviation Administration
FQIS—Fuel quantity indicating system
FSDO—Flight Standards District Office
GVI—General visual inspection
ICA—Instructions for Continued Airworthiness
ICAO—International Civil Aviation Organization
IFE—In-flight entertainment
IIWG—Intrusive Inspection Working Group
JAA—Joint Aviation Authority
JAR—Joint Aviation Requirements
MS—Military specification
NPRM—notice of proposed rulemaking
NTSB—National Transportation Safety Board
OMB—Office of Management and Budget
RTCA—Radio Technical Commission for Aeronautics
SAE—Society of Automotive Engineers
SCR—Special certification review
SFAR—Special federal aviation regulation
SFAR 88—Special Federal Aviation Regulation 88—Fuel Tank System Fault Tolerance Evaluation Requirements—TC- and STC-holder requirements included in the FTSR
STC—Supplemental type certificate
SWAMP—Severe wind and moisture problem
SWPM—Standard wiring practices manual
TC—Type certificate
TSB—Transportation Safety Board of Canada
WHCSS—White House Commission on Aviation Safety and Security

Appendix B

CORRELATION BETWEEN PROPOSED NEW PART 25 REGULATIONS AND EXISTING REGULATIONS

Proposed new regulation and title	Section	Based on existing requirements in
§ 25.1701 Definition	(a)	none

CORRELATION BETWEEN PROPOSED NEW PART 25 REGULATIONS AND EXISTING REGULATIONS—Continued

Proposed new regulation and title	Section	Based on existing requirements in
	(b)	none
	(c)	none
	(d)	none
§ 25.1703 Function and installation: EWIS	(a)(1)	§ 25.1301(a)
	(a)(2)	§ 25.1301(c)
	(a)(3)	§ 25.1301(d)
	(a)(4)	none
	(b)	none
	(c)	§ 25.869(a)(3)
	(d)	none
§ 25.1705 System safety: EWIS	(a)(1)	§ 25.1309(b)(1)
	(a)(2)	§ 25.1309(b)(1)
	(b)	§ 25.1309(b)(2)
§ 25.1709 System separation: EWIS	(a)	§ 25.1353(a)
	(b)(1)	§ 25.1353(a)
	(b)(2)	none
	(c)	§ 25.1353(b)
	(d)(1)	§ 25.1351(b)(1)
	(d)(2)	§ 25.1351(b)(2)
	(e)(1)	§ 25.869(a)(3)(i)
	(e)(2)	§ 25.869(a)(3)(ii) § 25.1353(d)(3)
	(f)(1)	§ 25.869(a)(3)(i)
	(f)(2)	§ 25.869(a)(3)(ii) § 25.1353(d)(3)
	(g)	§ 25.1353(d)(3)
	(h)(1)	§ 25.1353(d)(3)
	(h)(2).	
	(i)(1)	§ 25.1353(d)(3)
	(i)(2).	
	(i)(3).	
	(j)(1)	§ 25.1353(d)(3)
	(j)(2).	
	(k)	none
	(l)	§ 25.1353(d)(3)
§ 25.1711 Component identification: EWIS.		
	(a)	§ 25.1301(b)
	(b)(1)	none
	(b)(2)	none
	(c)	§ 25.1353(d)(2)
	(d)	none
	(e)	none
§ 25.1713 Fire protection: EWIS	(a)	§ 25.869(a)(1)
	(b)	§ 25.869(a)(2)
	(c)	§ 25.869(a)(4)
§ 25.1717 Electrical bonding and protection against static electricity: EWIS	(a)	§ 25.899
	(b)	none
§ 25.1719 Systems and functions: EWIS	(a)	none
	(b)(1)	§ 25.773(b)(2)
	(b)(2)	§ 25.981
	(b)(3)	§ 25.1165
	(b)(4)	§ 25.1310
	(b)(5)	§ 25.1316
	(b)(6)	§ 25.1351
	(b)(7)	§ 25.1355
	(b)(8)	§ 25.1360
	(b)(9)	§ 25.1362
	(b)(10)	§ 25.1365
	(b)(11)	§ 25.1431(c) § 25.1431(d)
§ 25.1721 Circuit protection devices: EWIS		§ 25.1353(d)(1)
§ 25.1723 Instruments using a power supply: EWIS		§ 25.1331(a)(2) § 25.1303(b)
§ 25.1725 Accessibility provisions: EWIS		§ 25.611
§ 25.1727 Protection of EWIS	(a)(1)	§ 25.855(e)(1)
	(a)(2)	§ 25.855(e)(2)
	(b)	none
	(c)	none
§ 25.1729 Flammable fluid fire protection: EWIS		§ 25.863(b)(3)
§ 25.1731 Powerplants: EWIS	(a)	§ 25.903(b)
	(b)	§ 25.903(d)(1)

CORRELATION BETWEEN PROPOSED NEW PART 25 REGULATIONS AND EXISTING REGULATIONS—Continued

Proposed new regulation and title	Section	Based on existing requirements in
§ 25.1733 Flammable fluid shutoff means: EWIS		§ 25.1189(d)
§ 25.1735 Fire detector systems, general: EWIS		none
§ 25.1737 Powerplant and APU fire detector system: EWIS	(a)	§ 25.1203(e)
	(b)(1)	§ 25.1203(f)(1)
	(b)(2)	§ 25.1203(f)(2)
§ 25.1739 Instructions for Continued Airworthiness: EWIS		§ 25.1529

The term ''none'' in the above table indicates that the section in the proposed regulation is a new rule.

Appendix C

CORRELATION BETWEEN EXISTING PART 25 REGULATIONS AND PROPOSED NEW REGULATIONS

Existing regulation and title	Section	Proposed new regulation
§ 25.611 Accessibility provisions		§ 25.1725
§ 25.773 Pilot compartment view	(b)(2)	§ 25.1719(b)(1)
§ 25.855 Cargo or baggage compartments	(e)(1)	§ 25.1727(a)(1)
	(e)(2)	§ 25.1727(a)(2)
§ 25.863 Flammable fluid fire protection	(b)(3)	§ 25.1729
§ 25.869 Fire protection: systems	(a)(1)	§ 25.1713(a)
	(a)(2)	§ 25.1713(b)
	(a)(4)	§ 25.1713(c)
	(a)(3)(i)	§ 25.1709(e)(1)
	(a)(3)(ii)	§ 25.1709(e)(2)
		§ 25.1709(f)(1)
		§ 25.1709(f)(2)
	(a)(4)	§ 25.1713(c)
§ 25.899 Electrical bonding and protection against static electricity		§ 25.1717(a)
§ 25.903 Engines	(b)	§ 25.1731(a)
	(d)(1)	§ 25.1731(b)
§ 25.1165 Engine ignition systems		§ 25.1719(b)(3)
§ 25.1189 Shutoff means	(d)	§ 25.1733
§ 25.1203 Fire detector system	(e)	§ 25.1737(a)
	(f)(1)	§ 25.1737(b)(1)
	(f)(2)	§ 25.1737(b)(2)
§ 25.1301 Function and installation	(a)	§ 25.1703(a)(1)
	(c)	§ 25.1703(a)(2)
	(b)	§ 25.1711(a)
	(d)	§ 25.1703(a)(3)
§ 25.1303 Flight and navigation instruments	(b)	§ 25.1723
§ 25.1309 Equipment, systems, and installations	(b)(1)	§ 25.1705(a)(1)
		§ 25.1705(a)(2)
	(b)(2)	§ 25.1705(b)
	(e)	§ 25.1707
	(f)	§ 25.1707
§ 25.1316 System lightning protection		§ 25.1719(b)(5)
§ 25.1331 Instruments using a power supply	(a)(2)	§ 25.1723
§ 25.1351 General	(b)(1)	§ 25.1709(d)(1)
	(b)(2)	§ 25.1709(d)(2)
§ 25.1353 Electrical equipment and installations	(a)	§ 25.1709(b)(1)
	(a)	§ 25.1709(a)
	(b)	§ 25.1709(c)
	(d)(1)	§ 25.1721
	(d)(2)	§ 25.1711(c)
	(d)(3)	§ 25.1709(e)(1)
		§ 25.1709(e)(2)
	(d)(3)	§ 25.1709(f)(1)
		§ 25.1709(f)(2)
	(d)(3)	§ 25.1709(g)
	(d)(3)	§ 25.1709(h)(1)
		§ 25.1709(h)(2)
	(d)(3)	§ 25.1709(i)(1)
		§ 25.1709(i)(2)
		§ 25.1709(i)(3)
	(d)(3)	§ 25.1709(j)(1)
		§ 25.1709(j)(2)
	(d)(3)	§ 25.1709(l)
§ 25.1355 Distribution system		§ 25.1719(b)(5)

CORRELATION BETWEEN EXISTING PART 25 REGULATIONS AND PROPOSED NEW REGULATIONS—Continued

Existing regulation and title	Section	Proposed new regulation
§ 25.1360 Precautions against injury		§ 25.1719(b)(6)
§ 25.1362 Electrical supplies for emergency conditions		§ 25.1719(b)(7)
§ 25.1365 Electrical appliances, motors, and transformers		§ 25.1719(b)(8)
§ 25.1431 Electronic equipment	(c) (d)	§ 25.1719(b)(9)
§ 25.1529 Instructions for Continued Airworthiness		§ 25.1739

Appendix D

The tables below indicate which of the current rules will need to be changed to accommodate the new certification requirements and which will remain the same.

EXISTING PART 25 REQUIREMENTS REQUIRING REVISION TO SUPPORT NEW PROPOSED REGULATIONS

Existing regulation	Revision to existing regulation required?
§ 25.611	Yes.
§ 25.773	No.
§ 25.855	Yes.
§ 25.863	No.
§ 25.869	Yes.
§ 25.899	No.
§ 25.903	No.
§ 25.1165	No.
§ 25.1189	No.
§ 25.1203	Yes.
§ 25.1301	Yes.
§ 25.1309	Yes.
§ 25.1310	No.
§ 25.1316	No.
§ 25.1331	No.
§ 25.1351	No.
§ 25.1353	Yes.
§ 25.1355	No.
§ 25.1357	Yes.
§ 25.1360	No.
§ 25.1362	No.
§ 25.1365	No.
§ 25.1431	No.
§ 25.1529	No.

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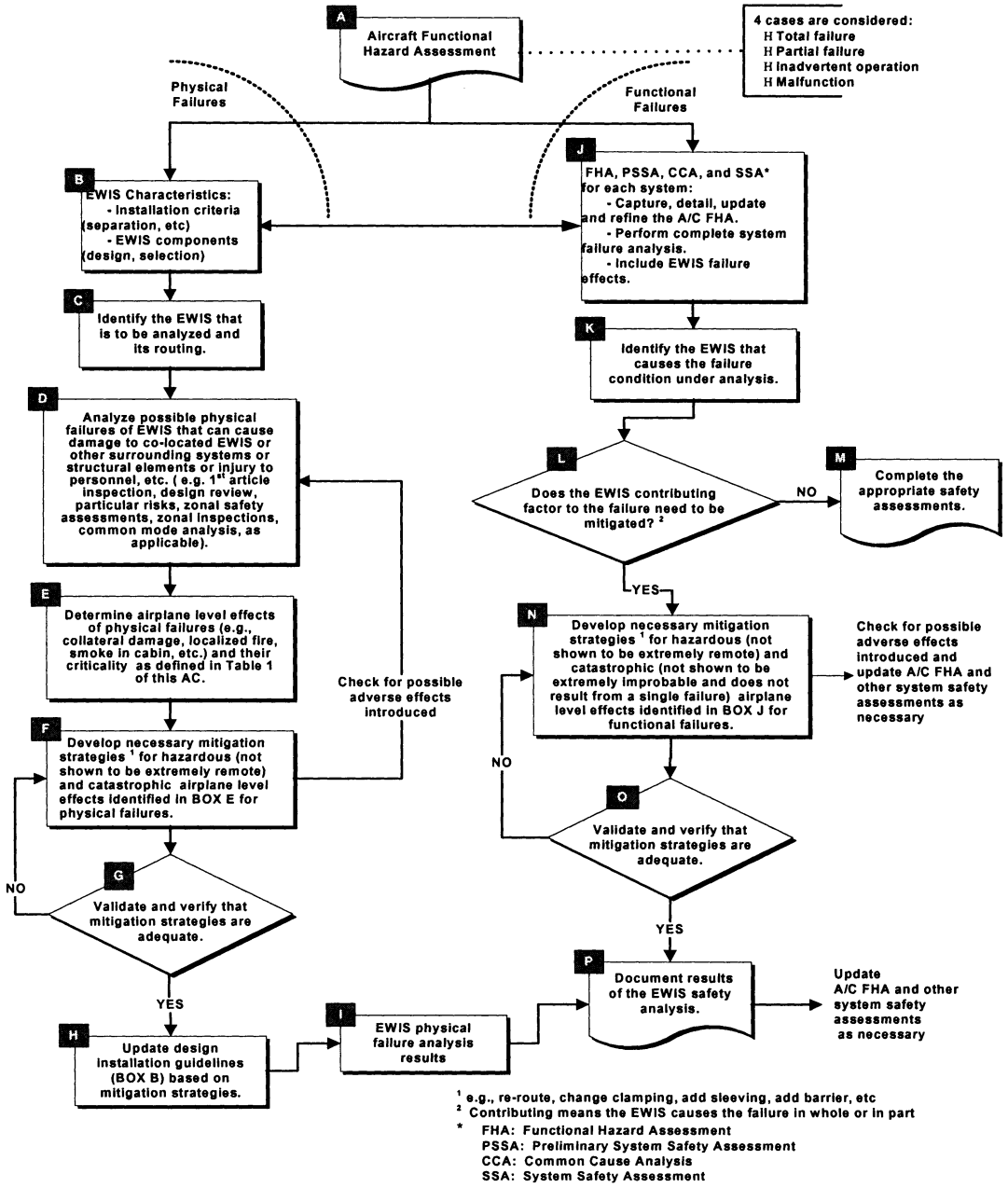
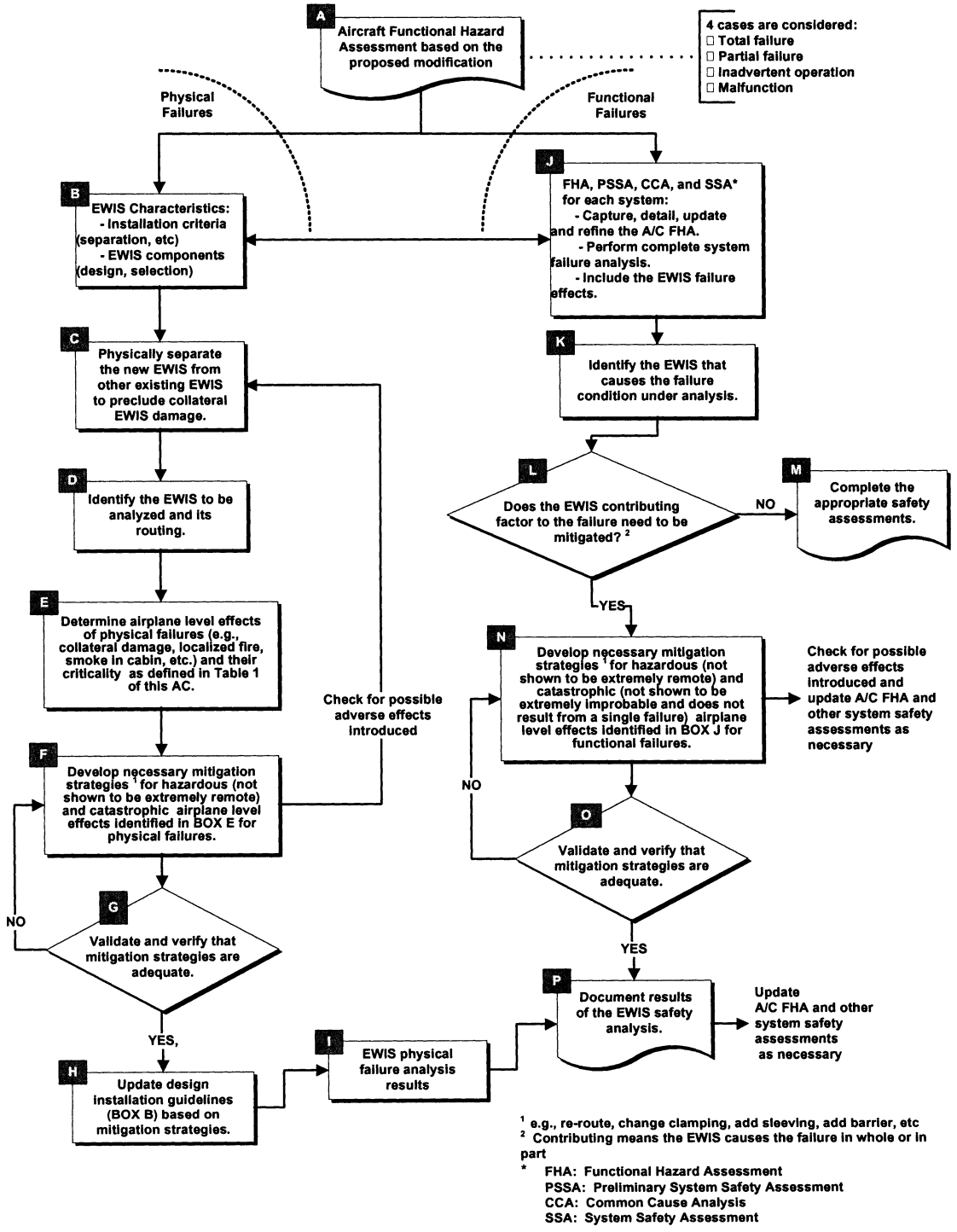
APPENDIX E

Flowchart 1: Pre- and Post-Type Certification Safety Analysis Concept (excerpt from proposed AC 25.17XX, "Certification of Electrical Wiring Interconnection Systems on Transport Category Airplanes")



Mitigation as used in these figures means to eliminate the hazard entirely or minimize its severity and probability to an acceptable level. In the case of the proposed rule, the EWIS failure must be mitigated to a point where the probability of a hazardous failure must be at least extremely remote and the probability of a catastrophic failure must be at least extremely improbable.

Flowchart 2: Post-TC Safety Analysis Concept: (excerpt from proposed AC 25.17XX, "Certification of Electrical Wiring Interconnection Systems on Transport Category Airplanes")



[1] e.g., re-route, change clamping, add sleeving, add barrier, etc
[2] Contributing means the EWIS causes the failure in whole or in part

* FHA: Functional Hazard Assessment
PSSA: Preliminary System Safety Assessment
CCA: Common Cause Analysis
SSA: System Safety Assessment

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Discussion of the EWIS Safety Analysis Process as Depicted in Flowcharts 1 and 2 (Excerpt From Proposed AC 25.17XX, ''Certification of Electrical Wiring Interconnection Systems on Transport Category Airplanes'')

The analysis described here is based on a qualitative approach to assessing EWIS safety as opposed to numerical, probability-based quantitative analysis. The intent is not to examine each individual wire and its relation to other wires. Rather, it is to ensure that there are no hazardous combinations. However, in case the ''top down'' analysis process described in this AC determines that a failure in a given bundle may lead to a catastrophic failure condition, the mitigation process may lead to performing a complete analysis of each wire in the relevant bundle.

The analysis described may be accomplished in conjunction with the required aircraft system safety assessments of §§ 25.1309, 25.671, etc.

The classification of failure conditions is given in Table 1 (found in the section-by-section discussion of proposed § 25.1705).

There are two flowcharts contained in this appendix:

- *Flowchart 1* applies to applicants for pre-TC work and for amended TCs, and STCs when the applicant has all data necessary to perform the analysis per Flowchart 1. If Flowchart 1 is used for post-TC modifications the available data must include identification of the systems in the EWIS under consideration for modification and the system functions associated with that EWIS.
- *Flowchart 2* applies to applicants for post-TC modifications when the applicant cannot identify the systems or systems functions contained in EWIS under consideration for modification

The analysis process is initiated by a functional hazard analysis performed at aircraft level identifying catastrophic and hazardous failure events.

The processes in both Flowcharts 1 and 2 identify two aspects: physical and functional failures.

Note: For this discussion the following definitions apply:

Validation: Determination that requirements for a product are sufficiently correct and complete.

Verification: Evaluation to determine that requirements have been met.

Physical Failure Analysis: Only single common cause events or failures need to be addressed during the physical failure analysis as described in this AC and shown on the left hand sides of Flowcharts 1 and 2. The objective of the physical analysis is to protect against single common cause events or failures that may involve single or multiple physical failures. Multiple common cause events or failures need not be addressed.

In relation to physical effects, it should be assumed that wires are carrying electrical energy and, in the case of an EWIS failure, as defined in the preceding paragraph, this energy may result in hazardous or catastrophic effects directly or when combined with other factors (fuel, oxygen, hydraulic fluid, or damage by passengers, for example). These failures, for example, may result in fire, smoke, emission of toxic gases, and damage to co-located systems and structural elements or injury to personnel. This analysis considers all EWIS from all systems regardless of criticality, (autopilot, auto throttle, PA system, IFE system, etc.).

Functional Failure Analysis: The functional failure analysis assumes that electrical wires are carrying power, signal, or information data. Failure of EWIS under these circumstances may lead to aircraft system degradation effects.

Descriptive Text for Flowchart 1

Box A

The functional hazard assessment (FHA) referred to in this box is not a stand-alone separate document specifically created to show compliance with § 25.1705. It is the aircraft level FHA that the applicant will have developed in compliance with § 25.1309 to help demonstrate acceptability of a design concept, identify potential problem areas or desirable design changes, or determine the need for and scope of any additional analyses (refer to AC/ACJ 25.1309–1B).

Physical Failures

Box B

EWIS Characteristics: Use the results of the FHA (BOX A) to identify EWIS installation criteria and definitions of component characteristics. Results of BOX B are fed into the preliminary system safety analysis (PSSA) and system safety analysis (SSA) of BOX J.

Boxes C, D, and E

Validation and Verification of Installation Criteria: Ensure that the EWIS component qualification satisfies the design requirements and that components are selected, used, and installed according to their qualification characteristics and the aircraft constraints linked to their location.

Using available information (e.g., digital mockup, physical mockup, aircraft, historical data), inspections and analyses (e.g., 1st article inspection, design review, particular risks, zonal safety assessments, zonal inspections, common mode analysis, as applicable) should be performed to validate that design and installation criteria are adequate to the zone/function, including multi-systems impact. Also, the inspections and analyses should be used to assess whether design and installation criteria were correctly applied. Special consideration should be given to those areas of the airplane that are known problem areas based on service history and historical data (e.g., arcing, smoke, loose clamps, chafing, arc tracking, interference with other systems, etc.). Special considerations should also be given to cases where new (previously unused) material or other technologies are used.

Deviations from installation and component selection criteria identified by these activities should be evaluated and a determination made about their acceptability. Alternative mitigation strategies should be developed as necessary.

Boxes F & G

Development and Validation of Mitigation Strategy: Identify and develop a mitigation strategy for the physical failures and their adverse effects identified in BOXES D and E.

- Validation and verification of the mitigation solution should ensure that:
- Hazardous failure conditions are extremely remote.
- Catastrophic failure conditions do not result from a single common cause event or failure.
- This mitigation solution does not introduce any new potential failure conditions.

Box H

Incorporate newly developed mitigation strategies (BOX F) into guidelines (BOX B) for further design and inspection and analysis process.

Box I

From the EWIS physical failure analysis, document the physical failures that were addressed, their effects, and the mitigation strategies that were developed. This information supports the final analysis documentation (BOX P).

Functional Failures

Box J

System Safety Assessment: Use results of the aircraft level FHA (BOX A) to guide the system level FHA (BOX J).

EWIS failures identified by § 25.1705 are to be incorporated into the system

level and aircraft level FHA, as necessary, the PSSA, the common cause analysis (CCA), and the SSA. These analyses are performed to satisfy requirements of § 25.1309.

Use results of these analyses to update the EWIS definition (BOX B).

Boxes K, L, and M

Hazardous and Catastrophic Failure Conditions: Use the analyses in BOX J to determine if the EWIS associated with the system under analysis can contribute (in whole or in part) to the failure condition under study. A determination needs to be made about whether the EWIS failure needs to be mitigated. If yes, a mitigation strategy needs to be developed, validated, and verified. If no, the appropriate safety assessment should be completed (e.g., per § 25.1309, § 25.671, etc.).

Boxes N and O

Development and Validation of Mitigation Strategy: Identify and develop a mitigation strategy for the functional failures and adverse effects identified in BOX J.

Validation and verification of the mitigation solution should determine if initial objective is fully reached and confirm that this mitigation solution is compatible with existing installations and installation criteria. If the EWIS was the failure cause, the subsequent mitigation strategy developed may introduce new adverse effects not previously identified by the analysis. A check for any new adverse effects should be accomplished and the aircraft level FHA and other system safety assessments should be updated as necessary.

Box P

After the mitigation strategies have been validated and verified, document the results of the § 25.1705 analysis. Update as necessary the aircraft level FHA that has been developed in support of certification of the proposed modification, in compliance with § 25.1309, (BOX A).

Descriptive Text for Flowchart 2

The main objectives are to ensure that the proposed modification will be correctly designed and installed and will not adversely affect existing systems.

As far as EWIS is concerned, correct incorporation of the modification should be ensured by both good knowledge of original aircraft manufacturer (OAM) installation practices and their correct implementation or by adequate separation of the added EWIS from existing EWIS. In either case, physical analyses should be performed (similar to the physical failures part of Flowchart 1).

Box A

Aircraft level effects must be considered for modified systems or systems added to the aircraft. If the applicant has the aircraft level FHA it should be examined to determine the airplane-level effect of the proposed modification. If the applicant doesn't have the aircraft level FHA, then the applicant must generate an aircraft level FHA based on the proposed modification. This aircraft level FHA would be limited to just those aircraft systems affected by the proposed modification. If it is determined that no aircraft level functional effects are introduced, a statement to this effect and the supporting data is sufficient to satisfy BOX A.

Physical Failures

Box B

EWIS Characteristics: Use results of the aircraft level FHA (BOX A) to identify EWIS installation criteria and definitions of component characteristics. Results of BOX B are fed into the PSSA and SSA of BOX J.

Box C

Separate the EWIS to be added from other existing airplane EWIS since it cannot be determined what systems or system functions are contained in the existing EWIS. Physical separation between the new and existing EWIS must be achieved through separation distance or an appropriate barrier or other means shown to be at least equivalent to the physical separation distance when allowed by § 25.1709. Methods given in the proposed advisory material for § 25.1709 provide an acceptable way to determine adequate separation.

In cases where separation cannot be maintained because of physical constraints (e.g., terminal strips and connectors, etc.), the applicant should accomplish the appropriate analysis to show that no adverse failure conditions exist because of sharing the common device. This requires that the applicant have knowledge of the systems or system functions sharing the common device (e.g. terminal strips and connectors etc.).

Boxes D and E

Validation and Verification of Installation Criteria

Ensure that the EWIS component qualification satisfies the design requirements and that components are selected, used, and installed according to their qualification characteristics and the aircraft constraints linked to their location.

Using available information (e.g., digital mockup, physical mockup, aircraft, historical data), inspections and analyses (e.g. 1st article inspection, design review, particular risks, zonal safety assessments, zonal inspections, common mode analysis, as applicable) should be performed to validate that design and installation criteria are adequate to the zone/function, including multi-systems impact. Also, inspections and analyses should be used to assess whether design and installation criteria were correctly applied. Special consideration should be given to those areas of the airplane that are known problem areas based on service history and historical data (e.g., arcing, smoke, loose clamps, chafing, arc tracking, interference with other systems, etc.). Special consideration should also be given to cases where new (previously unused) material or other technologies are used.

Deviation from installation and component selection criteria identified by these activities should be evaluated and a determination made about their acceptability. Alternative mitigation strategies should be developed as necessary.

Boxes F and G

Development & Validation of Mitigation Strategy

Identify and develop a mitigation strategy for the physical failures and their adverse effects identified in Boxes D and E.

Validation and verification of the mitigation solution should ensure that:

- Hazardous failure conditions are extremely remote.
- Catastrophic failure conditions do not result from a single common cause event or failure.
- This mitigation solution does not introduce any new potential failure conditions.

Box H

Incorporate newly developed mitigation strategies (Box F) into guidelines (Box B) for further design and inspection and analysis process.

Box I

From the EWIS physical failure analysis, document the physical failures that were addressed, their effects, and mitigation strategies that were developed. This information supports the final analysis documentation (Box P).

Functional Failures

Box J

System Safety Assessment

Use the results of the aircraft level FHA (Box A) to guide the system level FHA (Box J).

EWIS failures identified by § 25.1705 are to be incorporated into the system level and aircraft level FHA, as necessary, the PSSA, the CCA, and the SSA. These analyses are performed to satisfy requirements of § 25.1309.

Use results of these analyses to update the EWIS definition (Box B).

Boxes K, L, and M

Hazardous and Catastrophic Failure Conditions

Use the analyses in Box J to determine if the EWIS associated with the system under analysis can contribute (in whole or in part) to the failure condition under study. A determination needs to be made about whether the EWIS failure needs to be mitigated. If yes, a mitigation strategy needs to be developed, validated, and verified. If no, the appropriate safety assessment should be completed (e.g., per § 25.1309, § 25.671, etc.).

Boxes N and O

Development and Validation of Mitigation Strategy

Identify and develop a mitigation strategy for the functional failures and adverse effects identified in Box J.

Validation and verification of the mitigation solution should determine if initial objective is fully reached and confirm that this mitigation solution is compatible with existing installations and installation criteria. If the EWIS was the failure cause, the subsequent mitigation strategy developed may introduce new adverse effects not previously identified by the analysis. A check for any new adverse effects should be accomplished and the aircraft level FHA and other system safety assessments should be updated as necessary.

Box P

After the mitigation strategies have been validated and verified, document the results of the § 25.1705 analysis. Update as necessary the aircraft level FHA that has been developed in support of certification of the proposed modification, in compliance with § 25.1309, (Box A).

List of Subjects

14 CFR Part 1

Air Transportation.

14 CFR Parts 25, 91, 125

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

14 CFR Parts 121, 129

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

The Proposed Amendments

In consideration of the foregoing, the Federal Aviation Administration proposes to amend Chapter I of Title 14, Code of Federal Regulations parts 1, 25, 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 following abbreviation in alphabetical order:

§ 1.2 Abbreviations and symbols.

* * * * *

EWIS means electrical wiring interconnection system.

* * * * *

PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

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

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

4. Amend § 25.1 by adding a new paragraph (c) to read as follows:

§ 25.1 Applicability.

* * * * *

(c) This part also establishes requirements for holders of type certificates and changes to those certificates to take actions necessary to support the continued airworthiness of transport category airplanes.

5. Amend § 25.2 by adding a new paragraph (d) to read as follows:

§ 25.2 Special retroactive requirements.

* * * * *

(d) In addition to the requirements of this section, subpart I of this part contains requirements that apply to—

(1) Holders of type certificates; and

(2) Applicants for type certificates, changes to type certificates (including service bulletins describing design changes), and supplemental type certificates.

6. Amend § 25.611 by 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 § 25.1725.

7. Amend § 25.855 by removing the word ''wiring'' from paragraph (e) introductory text and adding new paragraph (j) as follows:

§ 25.855 Cargo or baggage compartments.

* * * * *

(j) Cargo or baggage compartment electrical wiring interconnection system components must meet the requirements of § 25.1727.

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

§ 25.869 Fire protection: systems.

(a) * * *

(1) * * *

(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.

* * * * *

9. Amend part 25 by adding a new § 25.899 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.

10. 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 at least fire-resistant.

* * * * *

(h) EWIS for each fire or overheat detector system in a fire zone must meet the requirements of § 25.1727.

11. Amend § 25.1301 by designating the introductory text as paragraph (a), redesignating paragraphs (a) through (d) as (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.

12. Amend § 25.1309 by removing paragraph (e) and redesignating 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 § 25.1705.

13. 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 three-or-more-engined airplanes.

(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.

14. Amend § 25.1353 by revising paragraphs (a), (b), and (d) 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) EWIS components must meet the requirements of § 25.1357, § 25.1703, § 25.1709, § 25.1711, and § 25.1721.

(c) * * *

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

15. 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.

* * * * *

16. 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.

17. 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 their causing a fire under these emergency conditions is minimized.

18. 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 so installed or protected 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 may 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 would create a smoke or fire hazard.

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

Subpart H—Electrical Wiring Interconnection Systems (EWIS)

Sec.

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 between two or more intended termination points. Except as provided for in paragraph (c) of this section, 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.

(b) The definition in paragraph (a) of this section covers 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 and wire integration units.

(c) Except for the equipment indicated in paragraph (b) 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) Function properly when installed.

(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, must allow for a reasonable degree of deformation and stretching without failure.

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

§ 25.1705 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.

§ 25.1707 [Reserved]

§ 25.1709 System separation: EWIS.

(a) Each EWIS must be designed and installed so that under normal conditions and failure conditions as defined by § 25.1309(b)(1) and (b)(2), it will not adversely affect the simultaneous operation of any other systems necessary for continued safe flight, landing, and egress. 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 essential circuits will be minimized under fault conditions.

(d) Each EWIS associated with independent airplane power sources 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) Any 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) Any 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 any 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) Any 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) Any 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) Any 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 § 25.1705, 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 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.

§ 25.1711 Component identification: EWIS.

(a) EWIS components must be labeled or otherwise identified using a consistent method that facilitates identification of the wire, 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 § 25.1705, , 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 at least 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 [Reserved]

§ 25.1717 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) Electrical bonding provided by EWIS components must provide an adequate electrical return path under both normal and fault conditions, on airplanes having grounded electrical systems.

§ 25.1719 Systems and functions: EWIS.

(a) EWIS associated with systems 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) § 25.1351 General.

(7) § 25.1355 Distribution system.

(8) § 25.1360 Precautions against injury.

(9) § 25.1362 Electrical supplies for emergency conditions.

(10) § 25.1365 Electrical appliances, motors, and transformers.

(11) § 25.1431(c) and (d) Electronic equipment.

§ 25.1721 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.

§ 25.1723 Instruments using a power supply: EWIS.

EWIS components associated with any instrument required by § 25.1303(b) that uses a power supply must be designed and installed so that failure of the EWIS components would not affect that instrument's compliance with § 25.1331(a)(2).

§ 25.1725 Accessibility provisions: EWIS.

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

§ 25.1727 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.

§ 25.1729 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 to be a potential ignition source and must meet the requirements of § 25.863.

§ 25.1731 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).

§ 25.1733 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.

§ 25.1735 Fire detector systems, general: EWIS.

EWIS associated with any installed fire protection system must be considered an integral part of the system in showing compliance with the applicable requirements for that system.

§ 25.1737 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 at least 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.

§ 25.1739 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.

20. Amend part 25 by adding new subpart I to read as follows.

Subpart I—Continued Airworthiness and Safety Improvements

Sec.

Subpart I—Continued Airworthiness and Safety Improvements

§ 25.1801 Purpose and definition.

(a) This subpart establishes requirements for support of the continued airworthiness of transport category airplanes. These requirements may include performing assessments, developing design changes, developing revisions to Instructions for Continued Airworthiness, and making necessary documentation available to affected persons. This subpart applies to the following persons, as specified in each section of this subpart:

(1) Holders of type certificates.

(2) Applicants for type certificates and changes to type certificates (including service bulletins describing design changes). Applicants for changes to type certificates must comply with the requirements of this subpart in addition to the airworthiness requirements determined applicable under § 21.101 of this subchapter.

(b) For purposes of this subpart, the ''FAA Oversight Office'' is the aircraft certification office or office of the Transport Airplane Directorate with oversight responsibility for the relevant type certificate or supplemental type certificate, as determined by the Administrator.

§ 25.1803 [Reserved]

§ 25.1805 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 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) Each person identified in paragraph (c) of this section must develop and submit for review and approval by the FAA Oversight Office Instructions for Continued Airworthiness for the representative airplane's EWIS in accordance with Appendix H paragraphs H25.5(a)(1) and (b) of this part in effect on [effective date of final rule] for each affected type design. For purposes of this section, the ''representative airplane'' is the configuration of each model series airplane that incorporates all variations of EWIS used on that series airplane, and that includes all TC-holder-designed modifications mandated by airworthiness directive as of the effective date of this rule. Each person specified in paragraph (c) of this section must also review any fuel tank system Instructions for Continued Airworthiness developed by that person to comply with SFAR 88 to ensure compatibility with the EWIS Instructions for Continued Airworthiness, including minimizing redundant requirements.

(c) The following persons must comply with the requirements of paragraph (b) of this section before the dates specified.

(1) Holders of type certificates (TC): December 16, 2007.

(2) Applicants for TCs, and amendments to TCs (including service bulletins describing design changes), if the date of application was before [effective date of final rule] and the certificate was issued on or after [effective date of final rule]: December 16, 2007, or the date the certificate is issued, whichever occurs later.

(3) Unless compliance with § 25.1739 of this part is required or elected, applicants for amendments to TCs, if the application was filed after [effective date of final rule]: December 16, 2007, or the date of approval of the application, whichever occurs later.

(4) Applicants for supplemental type certificates (STC), if the date of application was before [effective date of final rule] and the certificate was issued on or after [effective date of final rule]: June 16, 2008, or the date of approval of the application, whichever occurs later.

(5) Unless compliance with § 25.1739 of this part is required or elected, applicants for STCs, if the application was filed after [effective date of final rule]: June 16, 2008, or the date of approval of the application, whichever occurs later.

(d) Each person identified in paragraphs (c)(1), (c)(2), and (c)(4) of this section must submit to the FAA Oversight Office for approval a compliance plan by [insert date 90 days after effective date of final rule]. 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 (c) of this section.

(2) A proposed means of compliance with this section, identifying all required submissions, including all compliance items as mandated in Appendix H paragraphs H25.5(a)(1) and (b) of this part in effect on [effective date of this final rule], and all data to be developed to substantiate compliance.

(3) If the affected person proposes a means of compliance that differs from that described in FAA advisory material, a detailed explanation of how the proposed means will be shown to comply with this section.

(4) A proposal for submitting a draft of all compliance items required by paragraph (d)(2) of this section for review by the FAA Oversight Office not less than 60 days before the compliance time specified in paragraph (c) of this section.

(5) A proposal for how the approved Instructions for Continued Airworthiness will be made available to affected persons.

(e) Each affected person must implement the compliance plan as approved in compliance with paragraph

(d) of this section. If either paragraph (e)(1) or (2) of this section applies, the affected person must submit a corrected plan to the FAA Oversight Office and implement the corrected plan within 30 days after such notification.

(1) The FAA Oversight Office notifies the affected person of deficiencies in the proposed compliance plan and how to correct them.

(2) The FAA Oversight Office notifies the affected person of deficiencies in the person's implementation of the plan and how to correct them.

(f) This section does not apply to the following airplane models:

(1) Convair CV–240, 340, 440, if modified to include turbine engines.

(2) Lockheed L–188

(3) Vickers Armstrong Viscount

(4) Douglas DC–3, if modified to include turbine engines

(5) Bombardier CL–44

(6) Mitsubishi YS–11

(7) British Aerospace BAC 1–11

(8) Concorde

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

(10) VFW-Vereinigte Flugtechnische Werk VFW–614

(11) Illyushin Aviation IL 96T

(12) Bristol Aircraft Britannia 305

(13) Handley Page Herald Type 300

(14) Avions Marcel Dassault—Breguet Aviation Mercure 100C

(15) Airbus Caravelle

APPENDIX H TO PART 25—INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

21. Amend H25.1 by revising paragraph (a) to read as follows:

H25.1 General.

(a) This appendix specifies requirements for preparation of Instructions for Continued Airworthiness as required by §§ 25.1529, 25.1739, and applicable provisions of subpart I of this part.

* * * * *

22. Amend H25.4 by revising paragraph (a)(1) and adding new paragraph (a)(3) to read as follows:

H25.4 Airworthiness Limitations section.

(a) * * *

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

(2) * * *

(3) Any mandatory replacement time of EWIS components as defined in section 25.1701.

* * * * *

23. Amend Appendix H to part 25 by adding new paragraph H25.5 to read as follows:

H25.5 Electrical Wiring Interconnection System (EWIS) Instructions for Continued Airworthiness.

(a) The applicant must prepare Instructions for Continued Airworthiness 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 § 25.1709.

(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 Instructions for Continued Airworthiness must be in the form of a document appropriate for the information to be provided, and they must be easily recognizable as EWIS Instructions for Continued Airworthiness.

PART 91—GENERAL OPERATING AND FLIGHT RULES

24. The authority 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).

25. Amend part 91 by adding new Subpart L as follows:

Subpart L—Continued Airworthiness and Safety Improvements

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 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 7,500 pounds or more.

(b) For each airplane on which an auxiliary fuel tank is installed under a field approval, before December 16, 2007, 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 inspections, procedures, and limitations for fuel tank systems.

(d) The proposed fuel tank system inspection program revisions must be based on the following documents:

(1) The applicable type-certificate-holder-developed fuel tank Instructions for Continued Airworthiness, developed under SFAR 88, or under § 25.1529 in

effect on June 6, 2001, approved by the FAA Oversight Office.

(2) The applicable supplemental-type-certificate-holder-developed fuel tank Instructions for Continued Airworthiness, if any, developed under SFAR 88, or Instructions for Continued Airworthiness developed in accordance with § 25.1529 in effect on June 6, 2001, approved by the FAA Oversight Office.

(3) The applicable operator-developed inspection instructions for field-approved auxiliary fuel tanks, if any, approved by the FAA Oversight Office for the type certificate.

(e) After December 16, 2008, before returning an airplane to service after any alterations for which fuel tank Instructions for Continued Airworthiness 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 Instructions for Continued Airworthiness.

(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 cognizant Flight Standards District Office (FSDO) for review and approval.

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

(1) Convair CV–240, 340, 440, if modified to include turbine engines.

(2) Lockheed L–188

(3) Vickers Armstrong Viscount

(4) Douglas DC–3, if modified to include turbine engines

(5) Bombardier CL–44

(6) Mitsubishi YS–11

(7) British Aerospace BAC 1–11

(8) Concorde

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

(10) VFW-Vereinigte Flugtechnische Werk VFW–614

(11) Illyushin Aviation IL 96T

(12) Bristol Aircraft Britannia 305

(13) Handley Page Herald Type 300

(14) Avions Marcel Dassault—Breguet Aviation Mercure 100C

(15) Airbus Caravelle

26. Designate the text of current § 91.410 as new § 91.1505, removing and reserving paragraph (b), and revising the section heading to read as follows:

§ 91.1505 Repairs assessment for pressurized fuselages.

§ 91.410 [Reserved]

27. § 91.410 is reserved.

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

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

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

29. Amend part 121 by adding new subpart Y to read as follows:

Subpart Y—Continued Airworthiness and Safety Improvements

Sec.

Subpart Y—Continued Airworthiness and Safety Improvements

§ 121.901 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.

§ 121.903 [Reserved]

§ 121.905 [Reserved]

§ 121.907 [Reserved]

§ 121.909 [Reserved]

§ 121.911 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 December 16, 2008, 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 the following documents:

(1) The applicable EWIS Instructions for Continued Airworthiness, developed by the type certificate holder and approved by the FAA Oversight Office.

(2) The applicable EWIS Instructions for Continued Airworthiness, if any, developed for supplemental type certificates, approved by the FAA Oversight Office.

(d) After December 16, 2008, before returning an airplane to service after any alterations for which EWIS Instructions for Continued Airworthiness are developed, the certificate holder must include in the airplane's maintenance program inspections and procedures for EWIS based on those Instructions for Continued Airworthiness.

(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) Convair CV–240, 340, 440, if modified to include turbine engines.

(2) Lockheed L–188

(3) Vickers Armstrong Viscount

(4) Douglas DC–3, if modified to include turbine engines

(5) Bombardier CL–44

(6) Mitsubishi YS–11

(7) British Aerospace BAC 1–11

(8) Concorde

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

(10) VFW-Vereinigte Flugtechnische Werk VFW–614

(11) Illyushin Aviation IL 96T

(12) Bristol Aircraft Britannia 305

(13) Handley Page Herald Type 300

(14) Avions Marcel Dassault—Breguet Aviation Mercure 100C

(15) Airbus Caravelle

§ 121.913 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 December 16, 2007, 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 inspections, procedures, and limitations for fuel tanks systems.

(d) The proposed fuel tank system maintenance program revisions must be based on the following documents:

(1) The applicable type-certificate-holder-developed fuel tank Instructions for Continued Airworthiness, developed under SFAR 88 or under § 25.1529 in effect on June 6, 2001, approved by the FAA Oversight Office.

(2) The applicable supplemental-type-certificate-holder-developed fuel tank Instructions for Continued Airworthiness, if any, developed under SFAR 88, or under § 25.1529 in effect on June 6, 2001, approved by the FAA Oversight Office.

(3) The applicable certificate-holder-developed maintenance instructions for field-approved auxiliary fuel tanks, if any, approved by the FAA Oversight Office for the type certificate.

(e) After December 16, 2008, before returning an aircraft to service after any alteration for which fuel tank Instructions for Continued Airworthiness 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 Instructions for Continued Airworthiness.

(f) The fuel tank system 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) Convair CV–240, 340, 440, if modified to include turbine engines.

(2) Lockheed L–188

(3) Vickers Armstrong Viscount

(4) Douglas DC–3, if modified to include turbine engines

(5) Bombardier CL–44

(6) Mitsubishi YS–11

(7) British Aerospace BAC 1–11

(8) Concorde

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

(10) VFW-Vereinigte Flugtechnische Werk VFW–614

(11) Illyushin Aviation IL 96T

(12) Bristol Aircraft Britannia 305

(13) Handley Page Herald Type 300

(14) Avions Marcel Dassault—Breguet Aviation Mercure 100C

(15) Airbus Caravelle

§ 121.368 [Redesignated as § 121.905]

30. Redesignate § 121.368 as new § 121.905 and reserve §121.368.

§ 121.368 [Reserved]

31. § 121.368 is reserved.

32. Designate the text of current § 121.370 as new § 121.907, removing and reserving paragraph (b), and revising the section heading to read as follows:

§ 121.907 Repairs assessment for pressurized fuselages.

§ 121.370 [Reserved]

33. § 121.370 is reserved.

§ 121.370a [Redesignated as §121.909]

34. Redesignate § 121.370a as new §121.909 and reserve § 121.370a.

§ 121.370a [Reserved]

35. § 121.370a is reserved.

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

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

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

37. Amend part 125 by adding new subpart M to read as follows:

Subpart M—Continued Airworthiness and Safety Improvements

Sec.

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 December 16, 2007, 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 inspections, procedures, and limitations for fuel tank systems.

(d) The proposed fuel tank system inspection program revisions must be based on the following documents:

(1) The applicable type-certificate-holder-developed fuel tank Instructions for Continued Airworthiness, developed under SFAR 88, or under § 25.1529 in effect on June 6, 2001, approved by the FAA Oversight Office.

(2) The applicable supplemental-type-certificate-holder-developed fuel tank Instructions for Continued Airworthiness, if any, developed under SFAR 88, or under § 25.1529 in effect on June 6, 2001, approved by the FAA Oversight Office.

(3) The applicable certificate-holder-developed inspection instructions for field-approved auxiliary fuel tanks, if any, approved by the FAA Oversight Office for the type certificate.

(e) After December 16, 2008, before returning an aircraft to service after any alteration for which fuel tank Instructions for Continued Airworthiness 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 Instructions for Continued Airworthiness.

(f) The fuel tank system 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) Convair CV–240, 340, 440, if modified to include turbine engines.

(2) Lockheed L–188

(3) Vickers Armstrong Viscount

(4) Douglas DC–3, if modified to include turbine engines

(5) Bombardier CL–44

(6) Mitsubishi YS–11

(7) British Aerospace BAC 1–11

(8) Concorde

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

(10) VFW-Vereinigte Flugtechnische Werk VFW–614

(11) Illyushin Aviation IL 96T

(12) Bristol Aircraft Britannia 305

(13) Handley Page Herald Type 300

(14) Avions Marcel Dassault—Breguet Aviation Mercure 100C

(15) Airbus Caravelle

38. Designate the text of current § 125.248 as new § 125.505, removing and reserving paragraph (b), and revising the section heading to read as follows:

§ 125.505 Repairs assessment for pressurized fuselages.

§ 125.248 [Reserved]

39. § 125.248 is reserved.

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

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

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

41. Amend part 129 by:

A. Designating the existing sections, except §§ 129.16, 129.32, and 129.33, as ''Subpart A—General'';

B. Revising paragraph (b) of § 129.1;

C. Redesignating §§ 129.16, 129.32, and 129.33 as §§ 129.109, 129.107, and 129.105, respectively, and revising the heading for newly designated § 129.107 and removing and reserving paragraph (b); and

D. Adding a new subpart B.

The revisions and additions read as follows:

Subpart A—General

§ 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.

* * * * *

Subpart B—Continued Airworthiness and Safety Improvements

Sec.

Subpart B—Continued Airworthiness and Safety Improvements

§ 129.101 Purpose and definition.

(a) This subpart requires a foreign 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]

§ 129.105 [Redesignated from § 129.33]

§ 129.107 [Redesignated from § 129.32]

§ 129.109 [Redesignated from §129.16]

§ 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 December 16, 2008, no foreign person or foreign air carrier may operate an 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 the following documents:

(1) The applicable EWIS Instructions for Continued Airworthiness, developed by the type certificate holder and approved by the FAA Oversight Office.

(2) The applicable EWIS Instructions for Continued Airworthiness, if any, developed for supplemental type certificates, approved by the FAA Oversight Office.

(d) After December 16, 2008, before returning an airplane to service after any alterations for which EWIS Instructions for Continued Airworthiness 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 Instructions for Continued Airworthiness.

(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 cognizant Flight Standards International Field Office for review and approval.

(f) This section does not apply to the following airplane models:

(1) Convair CV–240, 340, 440, if modified to include turbine engines.

(2) Lockheed L–188

(3) Vickers Armstrong Viscount

(4) Douglas DC–3, if modified to include turbine engines

(5) Bombardier CL–44

(6) Mitsubishi YS–11

(7) British Aerospace BAC 1–11

(8) Concorde

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

(10) VFW-Vereinigte Flugtechnische Werk VFW–614

(11) Illyushin Aviation IL 96T

(12) Bristol Aircraft Britannia 305

(13) Handley Page Herald Type 300

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

(15) Airbus Caravelle

§ 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 airplane on which an auxiliary fuel tank is installed under a field approval, before December 16, 2007, 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 an airplane identified in paragraph (a) of this section unless the maintenance program for that airplane has been revised to include inspections, procedures, and limitations for fuel tanks systems.

(d) The proposed fuel tank system maintenance program revisions must be based on the following documents:

(1) The applicable type-certificate-holder-developed fuel tank Instructions for Continued Airworthiness, developed under SFAR 88, or under § 25.1529 in effect on June 6, 2001, approved by the FAA Oversight Office.

(2) The applicable supplemental-type-certificate-holder-developed fuel tank Instructions for Continued Airworthiness, if any, developed under SFAR 88, or Instructions for Continued Airworthiness developed in accordance with § 25.1529 in effect on June 6, 2001, approved by the FAA Oversight Office.

(3) The applicable maintenance instructions for field-approved auxiliary fuel tanks, if any, developed by the foreign person or foreign air carrier operating the airplane and approved by the FAA Oversight Office for the type certificate.

(e) After December 16, 2008, before returning an airplane to service after any alteration for which fuel tank Instructions for Continued Airworthiness 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 Instructions for Continued Airworthiness.

(f) The fuel tank system 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 cognizant Flight Standards International Field Office for review and approval.

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

(1) Convair CV–240, 340, 440, if modified to include turbine engines.

(2) Lockheed L–188

(3) Vickers Armstrong Viscount

(4) Douglas DC–3, if modified to include turbine engines

(5) Bombardier CL–44

(6) Mitsubishi YS–11

(7) British Aerospace BAC 1–11

(8) Concorde

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

(10) VFW-Vereinigte Flugtechnische Werk VFW–614

(11) Illyushin Aviation IL 96T

(12) Bristol Aircraft Britannia 305

(13) Handley Page Herald Type 300

(14) Avions Marcel Dassault—Breguet Aviation Mercure 100C

(15) Airbus Caravelle

Issued in Washington, DC on September 22, 2005.

James J. Ballough,

Director, Flight Standards Service.

John J. Hickey,

Director, Aircraft Certification Service.

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