U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Incorporation of Electrical Wiring Interconnection Systems Instructions for Continued Airworthiness into an Operator's Maintenance Program

Date: 9/12/12
Initiated by: AFS-300

AC No: 120-102A
Change:

On November 8, 2007, the Federal Aviation Administration (FAA) published the Enhanced Airworthiness Program for Airplane Systems/Fuel Tank Safety (EAPAS/FTS) final rule. The intent of the rule is to help ensure the continued safety of commercial airplanes by improving the design, installation, and maintenance of electrical wiring systems. Title 14 of the Code of Federal Regulations (14 CFR) part 121, § 121.1111, and part 129, § 129.111 include requirements for operators to revise their maintenance programs to include instructions for continued airworthiness (ICA), which include inspections and procedures for the electrical wiring interconnection systems (EWIS). This advisory circular (AC) only addresses the EWIS requirements and provides guidance accordingly. The current edition of AC 120-97, Incorporation of Fuel Tank System Instructions for Continued Airworthiness into Operator Maintenance or Inspection Programs, provides guidance for operators to comply with the fuel tank safety (FTS) requirements in the EAPAS/FTS rule.

for

John M. Allen
Director, Flight Standards Service

CONTENTS

CHAPTER 1. GENERAL

1-1. PURPOSE. This advisory circular (AC) provides guidance for Title 14 of the Code of Federal Regulations (14 CFR) part 121 certificate holders and 14 CFR part 129 operators (part 129, § 129.14) of U.S.-registered airplanes (hereafter both are referred to as "operators") regarding compliance with the Enhanced Airworthiness Program for Airplane Systems/Fuel Tank Safety (EAPAS/FTS) rule.

a. Definition. The EAPAS/FTS rule contains new certification and operation requirements for the airplanes' electrical wiring interconnection systems (EWIS). It requires the development of Federal Aviation Administration (FAA) Oversight Office-approved EWIS instructions for continued airworthiness (ICA). It defines EWIS as including "any wire, wiring device, or combination of these, including termination devices, installed in any area of the airplane for the purpose of transmitting electrical energy, including data and signals, between two or more intended termination points."

b. Requirements. The EWIS ICA have been developed using an enhanced zonal analysis procedure (EZAP). Refer to Appendix 2, Definitions, for the definition of EZAP. The requirements to develop these EWIS ICA are contained in 14 CFR part 25, § 25.1729, and part 26, § 26.11. These sections refer to EWIS ICA requirements contained in part 25 appendix H, § H25.5(a)(1) and (b). This AC provides guidance for EWIS ICA that have been developed in accordance with § 26.11 and the current edition of AC 25-27, Development of Transport Category Airplane Electrical Wiring Interconnection Systems Instructions for Continued Airworthiness Using an Enhanced Zonal Analysis Procedure.

1-2. APPLICABILITY. This AC applies to operators of transport category turbine-powered airplanes with a type certificate (TC) issued after January 1, 1958 that, as a result of original type certification or later increase in capacity, have a maximum type-certificated passenger capacity of 30 or more, or a maximum payload capacity of 7,500 pounds or more. This AC can also be used as a method of compliance for any transport category airplane that has § 25.1729 in its certification basis.

> **NOTE: The phrase "original type certification or later increase in capacity" addresses two situations. In the past, some designers and operators avoided applying requirements mandated only for airplanes over a specific capacity by receiving a design change approval for a slightly lower capacity. By referencing the capacity resulting from original certification, the rule removes this means of avoiding compliance. Also, the FAA could have originally certified an airplane design with a capacity slightly lower than the minimum specified in the rule, but through later design changes, the capacity could be increased above this minimum. The reference to later increase in capacity in the rule ensures that, if this occurs, the design would have to meet the requirements of the rule.**

1-3. BACKGROUND.

a. TWA Flight 800. Since 1959, there have been 18 fuel tank explosions. Most notably, on July 17, 1996, a 25-year-old Boeing 747-100 series airplane was involved in an in-flight breakup after takeoff from Kennedy International Airport in New York, resulting in 230 fatalities. The National Transportation Safety Board (NTSB) determined that the probable cause of the TWA Flight 800 accident was an explosion of the center wing fuel tank (CWT) resulting from ignition of the flammable fuel and air mixture in the tank. The NTSB could not conclusively determine the source of ignition energy for the explosion, though the most likely cause 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 indicator system (FQIS).

b. Swissair Flight 111. Two years after the TWA accident, in September 1998, an MD-11 airplane, Swissair Flight 111, crashed into the Atlantic Ocean off the coast of Nova Scotia, Canada. In its final accident report, The Transportation Safety Board of Canada (TSB) determined that there was smoke and a fire above the ceiling in the cockpit. In the report, the TSB could not identify the exact cause of the fire; 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." The TSB determined that this resolidified copper was located in the area where the fire most likely originated.

c. Investigation. Investigation of these two accidents, and subsequent examinations of many other airplanes, showed that deteriorated wiring, corrosion, and improper wire installation and repairs were common conditions in the EWIS. In addition, wire bundles contaminated with metal shavings, dust, and fluids were also common conditions in representative examples of transport airplanes. These contaminants could damage EWIS and also provide fuel for an electrical fire.

d. FAA's Conclusions.

(1) The FAA concluded that the following ICA for the EWIS are too general, and not described in enough detail in maintenance manuals:

(a) Wiring maintenance practices,

(b) Wiring components,

(c) Wiring inspection criteria, and

(d) Wiring repair and installation instructions.

(2) Therefore, the FAA determined that to correct these deficiencies, future ICA developed for the EWIS must define:

(a) What has to be done,

(b) When it has to be done,

(c) How it will be accomplished, and

(d) That EWIS ICA must be FAA-approved.

e. EAPAS/FTS Final Rule. On November 8, 2007, the FAA published the EAPAS/FTS rule. This rule helps ensure the continued safety of commercial airplanes by improving the design, installation, and maintenance of the airplanes' EWIS. The rule also includes new certification (§ 26.11 and § 25.1701 through § 25.1733) and operation (14 CFR part 121, § 121.1111, and § 129.111) requirements. Part 26 subpart A establishes design approval holder (DAH) requirements for support of the continued airworthiness and safety improvements for turbine-powered transport category airplanes.

NOTE: For the purposes of this AC, a DAH refers to the TC and Supplemental Type Certificate (STC) holder when used in context.

NOTE: For the purposes of this AC, the FAA Oversight Office is defined in § 26.3 as the Aircraft Certification Office (ACO) or the office of the Transport Airplane Directorate with oversight responsibility for the relevant TC, STC, or manufacturer as determined by the Administrator.

f. New 14 CFR Subparts. Section 121.1101 subpart AA, and § 129.101 subpart B requires operators to support the continued airworthiness of each airplane. These new requirements may include revising the maintenance or inspection program, incorporating design changes, incorporating revisions to ICA, and making necessary documentation available to affected persons (refer to Appendix 2). These new subparts will also improve the reader's ability to readily identify rules pertinent to continued airworthiness.

1-4. RELATED CFR PARTS. The Regulatory and Guidance Library (RGL) is a set of searchable databases that contain regulatory, guidance, and aviation product information. The RGL contains certain Federal aviation regulations and Special Federal Aviation Regulations (SFAR) from 14 CFR in their current versions as well as historical versions. The current editions of the following sections of 14 CFR apply:

- Part 21, § 21.50, Instructions for Continued Airworthiness and Manufacturer's Maintenance Manuals Having Airworthiness Limitation Sections.
- Part 25, § 25.1529, Instructions for Continued Airworthiness.
- Part 25, § 25.1729, Instructions for Continued Airworthiness: EWIS.
- Part 25 Appendix H, Electrical Wiring Interconnection Systems (EWIS).
- Part 26 Subpart A, Continued Airworthiness and Safety Improvements for Transport Category Airplanes.
- Part 26, § 26.11, Electrical Wiring Interconnection Systems (EWIS) Maintenance Program.
- Part 43, § 43.13, Performance Rules (General).
- Part 121 Subpart AA, Continued Airworthiness and Safety Improvements.
- Part 121, § 121.1111, Electrical Wiring Interconnection Systems (EWIS) Maintenance Program.
- Part 129 Subpart B, Continued Airworthiness and Safety Improvements.

- Part 129, § 129.111, Electrical Wiring Interconnection Systems (EWIS) Maintenance Program.

1-5. RELATED READING MATERIALS (Current editions).

a. ACs. You can locate each of the following ACs at http://www.faa.gov/regulations_policies/advisory_circulars.

(1) AC 25-8, Auxiliary Fuel System Installations.

(2) AC 25-19, Certification Maintenance Requirements.

(3) AC 25-27, Development of Transport Category Airplane Electrical Wiring Interconnection Systems Instructions for Continued Airworthiness Using an Enhanced Zonal Analysis Procedure.

(4) AC 25.981-1, Fuel Tank Ignition Source Prevention Guidelines.

(5) AC 25.981-2, Fuel Tank Flammability.

(6) AC 25.1701-1 Certification of Electrical Wiring Interconnection Systems on Transport Category Airplanes.

(7) AC 25.981.2A, Fuel Tank Flammability Reduction Means.

(8) AC 26-1, Part 26, Continued Airworthiness and Safety Improvements.

(9) AC 120-16, Air Carrier Maintenance Programs.

(10) AC 120-94, Aircraft Electrical Wiring Interconnection Systems Training Program.

(11) AC 120-97, Incorporation of Fuel Tank System Instructions for Continued Airworthiness into the Operator Maintenance or Inspection Program.

(12) AC 121-22, Maintenance Review Board Report Maintenance Type Board, and OEM/TCH Inspection Program Procedures.

(13) AC 129-4, Maintenance Programs for U.S.-Registered Aircraft Operated Under 14 CFR Part 129.

b. FAA Orders.

(1) Order 8110.54, Instructions for Continued Airworthiness Responsibilities, Requirements, and Contents.

(2) Order 8110.104, Responsibilities and Requirements for Implementing Part 26 Safety Initiatives.

c. Industry References. The Air Transport Association of America (ATA) Operator/Manufacturer Scheduled Maintenance Development, Maintenance Steering Group—3rd Task Force (MSG-3) and later revisions. The ATA is now the Airlines 4 America (A4A).

1-6. FAA POLICY STATEMENTS (Available for download at http://rgl.faa.gov).

a. PS-ANM110-7-12-2005, Safety—A Shared Responsibility—New Direction for Addressing Airworthiness Issues for Transport Airplanes.

(1) On July 12, 2005, the FAA issued policy statement PS-ANM110-7-12-2005. The policy states, in part:

> "Based on our evaluation of more effective regulatory approaches for certain types of safety initiatives…the FAA has concluded that we need to adopt a regulatory approach recognizing the shared responsibility between design approval holders (DAHs) and operators. When we decide that general rulemaking is needed to address an airworthiness issue, and believe the safety objective can only be fully achieved if the DAHs provide operators with the necessary information in a timely manner, we will propose requirements for the affected DAHs to provide that information…"

(2) To implement this policy, the FAA established a new § 26.11 in the EAPAS/FTS rule. The new § 26.11 requires the DAH to develop ICA for EWIS for certain existing transport category airplanes and submit them to the FAA Oversight Office for approval.

b. PS-AIR-100-2009-05-27, Adding Part 26 to Type Certificate Data Sheets and Supplemental Type Certificates. On October 22, 2007, 14 CFR adopted a new part 26, Enhanced Airworthiness Program for Airplane Systems (EAPAS). Since its issuance, part 26 has been amended twice.

c. PS-AIR-100-2007-12-27A, Enhanced Airworthiness Program for Airplane Systems (EAPAS) Supplemental Type Certificate (STC) Limitation. On July 7, 2008, the FAA issued policy statement PS-AIR-100-2007-12-27A (refer to paragraph 2-7 of this AC for a detailed discussion).

d. PS-AIR-100-2007-12-27B, Enhanced Airworthiness Program for Airplane Systems (EAPAS) Supplemental Type Certificate (STC) Limitation. On June 10, 2009, the FAA issued revised policy statement PS-AIR-100-2007-12-27B. This revision adds part 26 to type data sheets and STCs.

e. PS-ANM-08-113-001, Clarification of Maximum Payload Capacity Definition in Design Approval Holder Rules. On September 12, 2008, the FAA issued policy statement PS-ANM-08-113-001. The maximum payload capacity criterion is used, along with other criteria, to determine whether a rule is applicable to a DAH. However, there has been confusion on the use and definition of the term. This policy memorandum clarifies the maximum payload capacity criterion when used with regard to these DAH rules and their corresponding operational rule.

CHAPTER 2. ENHANCED AIRWORTHINESS PROGRAM FOR AIRPLANE SYSTEMS (EAPAS) REQUIREMENTS

2-1. REQUIREMENTS. This advisory circular (AC) provides guidance to support operator compliance with the electrical wiring interconnection system (EWIS) maintenance program requirements contained in the Enhanced Airworthiness Program for Airplane Systems/Fuel Tank Safety (EAPAS/FTS) rule. Title 14 of the Code of Federal Regulations (14 CFR) part 121, § 121.1111 and part 129, § 129.111 require operators to incorporate Federal Aviation Administration (FAA) Oversight Office-approved EWIS instructions for continued airworthiness (ICA) into their maintenance program. The ICA consists of inspection and restoration tasks, task intervals, procedures to accomplish those tasks, and "protections and caution" instructions/information for the EWIS. The design approval holder (DAH) develops and revises the ICA using the current edition of AC 25-27, Development of Transport Category Airplane Electrical Wiring Interconnection Systems Instructions for Continued Airworthiness Using an Enhanced Zonal Analysis Procedure. (For more information on enhanced zonal analysis procedure (EZAP), refer to Appendix 2.)

2-2. DESCRIPTION OF EWIS ICA REQUIRED BY 14 CFR PART 26, § 26.11.

a. Overview. EWIS ICAs required by § 26.11 are inspection and restoration tasks, procedures, and instructions to keep EWIS Airworthy throughout its operational life and are described below. The EWIS ICA required by § 26.11 are developed in accordance with 14 CFR part 25 Appendix H, § H25.5(a)(1) and (b).

(1) The inspection can be a zonal General Visual Inspection (GVI), stand-alone GVI, detailed inspection (DET), or a combination of these as required for a design change.

(2) Restoration tasks are usually cleaning tasks such as replacing an air filter in order to reduce the likelihood of contamination build-up within a zone.

NOTE: The type certificate holder (TCH) or applicant develops the inspection and restoration tasks using the Airlines for America (A4A), operator manufacturer scheduled maintenance development, Maintenance Steering Group – 3rd Task Force (MSG-3), and later revisions, and the EZAP described in the current edition of AC 25-27. A Supplemental Type Certificate (STC) holder or applicant does not utilize the Maintenance Review Board (MRB) process, but uses the guidance contained in the current edition of AC 25-27 to develop new or revise EWIS ICA as required for a design change.

(3) In addition to the inspection and restoration tasks, EWIS ICA can also include:

(a) A revised standard wiring practices/electrical standards manual that is presented in a standardized format using the guidance in AC 25-27 (refer to § H25.5(a)(2)).

(b) Wire separation requirements (refer to § H25.5(a)(3)).

(c) Information explaining the EWIS identification method and requirements for identifying any changes to EWIS (refer to § H25.5(a)(4)).

(d) Electrical load data (i.e. electrical load analysis) and instructions for updating that data (refer to § H25.5(a)(5)).

NOTE: The source document requirements only apply to EWIS inspection and restoration tasks.

(4) The DAH or applicant develops the EWIS ICA using the MSG-3 and the current edition of AC 25-27. An STC holder or applicant does not utilize the MSG-3, but can use guidance contained in the current edition of AC 25-27 to develop new or revise EWIS ICA as required for a design change.

b. Multiple Components. EWIS ICA can be, and almost always are, comprised of several different components. All of these components define a particular EWIS ICA. These components are located in multiple DAH-produced documents.

(1) As an example, EWIS ICA components can be located in one or more of the following documents:

- Document required by § H25.5(b) (commonly referred to as a "source document");
- Maintenance Review Board Report (MRBR);
- Maintenance Planning Document (MPD);
- Maintenance implementation document (MID);
- Airplane Maintenance Manual (AMM);
- Standard Wiring Practice Manual (SWPM);
- Electrical Standard Practices Manual (ESPM) (a term used by some TCH); or
- Stand-alone ICA document produced by an STC applicant.

(2) These components include such items as:

- Type of task (restoration/cleaning, stand-alone GVI, DET, or standard zonal GVI as identified in the MRBR or MID.)
- Task interval (e.g., every 16,000 flight cycles or 3,000 days).
- Airplane zone identification for airplanes with a zonal program (e.g., Zone 201).
- Task description as described in the MRBR and MID (e.g., Inspect (General Visual) all exposed EWIS in the wheel well.)

NOTE: The gear is extended with the handle down and gear locked in the down position and doors in open position.

- Airplane applicability as identified in the source document. Some models within the same family of airplanes may have differing maintenance requirements based on available options (e.g., freighter versus passenger version engine types).

- Task procedure(s) as described in the referenced AMM or other documents that contain the procedure(s). These are the actual instructions on how to perform the GVI, DET, and restoration/cleaning tasks that support the task description listed in the MRBR and MID.
- Supporting task procedure(s), if any, necessary to perform the task procedure in any other document referenced by the task procedure.
- Instructions for protections and caution information that will minimize contamination and accidental damage to EWIS (these can appear in different places, such as in the AMM or in the SWPM/ESPM). This information, if contained in the SWPM/ESPM (or other similar documents), should be in its chapter 20. Sometimes, this information is repeated in the standard practices chapter 20 of the AMM. In any case, it is general protections and caution information and it is not expected that unique procedures will be developed for individual EWIS ICA for a particular airplane model or models produced by the same manufacturer. The AMM or SWPM/ESPM will reference any protections and caution information specific to EWIS ICA.

c. EWIS Source Document. Section H25.5(b) states that the EWIS ICA developed in accordance with the requirements of § H25.5(a)(1) must be in the form of a document appropriate for the information provided, and must be easily recognizable as EWIS ICA or specifically reference other sections of the EWIS ICA that contain this information. This document is referred to as the source document. Section H25.5(b) does not prescribe a specific data form. The form is at the discretion of the DAH, as long as it meets the requirements of § H25.5(b). The entire EWIS ICA can be in the source document, or the source document can point to a series of other documents, such as the MRBR, MPD, MID, AMM, or SWPM/ESPM, which contain the EWIS ICA.

NOTE: The source document referenced above is FAA Oversight Office approved. The operational rules require operators to incorporate EWIS ICA into their maintenance program that have been FAA Oversight Office approved. The source document provides the information necessary for the operator to comply with §§ 121.1111 and 129.111.

d. Controlling Reference Numbers. Controlling reference numbers for the individual EWIS ICA tasks are listed in the MRBR, MPD, MID, or other maintenance documents. An example of a controlling reference number in an MRBR is “MM/MPD ref. 20-XXX-XX.” This number correlates to a cross reference number in the source document and the AMM, which is the actual maintenance task with all associated instructions to accomplish it. The DAH may refer to these reference numbers as MRB reference, AMM/MPD reference, Maintenance Significant Items (MSI) reference, task number, etc. It can vary. The TCH may consider one or all of the reference numbers part of the EWIS ICA. The DAH will identify all reference numbers necessary to fully track and identify the EWIS ICA. All reference numbers considered necessary to fully identify and track the EWIS ICA should be considered part of the EWIS ICA.

e. DAH Revisions to EWIS ICA. The DAH will revise the source document in order to account for any new or revised EWIS inspection or restoration procedures developed due to production changes, or designated changes mandated by AD. They will provide the revised

source document to operators after the document has been approved by the FAA Oversight Office.

2-3. EWIS ICA DEVELOPMENT REQUIRED BY § 25.1729. In addition to EWIS ICA that are required and developed under § 26.11 for existing in service airplanes, there will also be EWIS ICA developed under § 25.1729 for new airplane type certificates (TC), or when 14 CFR part 21, § 21.101, Designation of Applicable Regulations, requires the holder of an amended TC or an STC to comply with a corresponding amendment to part 25 that was issued on or after the date of the applicable part 26 provision. Section 21.101 is referred to as the Changed Product Rule. The EWIS ICA required by § 25.1729 are developed under § H25.5(a)(1) through (5), and (b). Simply stated, an operator can have airplanes that have EWIS ICA developed under § 26.11 and EWIS ICA developed under § 25.1729 which include all of § H25.5.

2-4. DESCRIPTION OF EWIS ICA REQUIRED BY § 26.11. The DAH is required to develop ICA for the "representative airplane's" EWIS according to § 26.11, as follows:

a. TCH. The TCH is required to develop EWIS ICA for the "representative airplane" in accordance with § 26.11(b). The purpose was to ensure that all variations of EWIS used in production were reviewed and appropriate ICA were developed. These EWIS ICA were developed in accordance with H25.5(a)(1) and (b), in effect on December 10, 2007 for each affected type design. The TCH submits those ICA for review and approval by the FAA Oversight Office.

NOTE: TCH with § 25.1729 in their certification basis will develop EWIS ICA in accordance with § H25.5(a) and (b).

b. STC/ATC Holders. STC/ATC holders are only required to develop EWIS ICA in compliance with § 26.11(c) or, if required or elected, in compliance with § 25.1729 if the application date for the STC or change to an existing STC was before December 10, 2007, and the FAA issued the certificate on or after December 10, 2007. New STC or amended applications filed after the effective date of the rule (December 10, 2007) are also required to develop FAA Oversight Office-approved EWIS ICA in compliance with § 26.11 or, if required or elected, in compliance with § 25.1729.

NOTE: STC/ATC holders with § 25.1729 in their certification basis will develop EWIS ICA in accordance with § H25.5(a) and (b).

2-5. WHY EWIS ICA APPROVAL IS NECESSARY. While the FAA accepts ICAs, the cognizant FAA Oversight Office must approve EWIS ICA. The development of EWIS ICA requirements can be complex, requiring qualitative engineering and maintenance assumptions. Approval will help ensure standardized application of these assumptions (e.g., zone density, zone size, potential effects of tire, environmental effects, etc.) and ensure that important information such as wire identification requirements and EWIS separation requirements developed during airplane certification are correctly and logically documented in the airplane's ICA documents. FAA approval also ensures that operators will be provided with the EWIS ICA and able to use the data/documents to comply with their operational requirements. It will also ensure that the

data/documents delivered to the operators will be standardized to the extent required by the EWIS ICA requirements.

2-6. TCH-DEVELOPED EWIS INSPECTION AND RESTORATION TASKS. The TCH can develop EWIS ICA in accordance with § H25.5(a)(1) and (b), which are invoked either by § 25.1729 or § 26.11(b) or (c), by utilizing the MSG-3 logic contained in the Air Transport Association Operator/Manufacturer Scheduled Maintenance Development Document (MSG-3) Revision 2005.1 and later revisions, and the current edition of AC 25-27. The EWIS ICA will be identified as EWIS ICA as required by § H25.5(b) in the source document developed by the TCH. As stated earlier in this AC, the TCH will:

- Develop a source document that contains all required EWIS ICA data;
- Develop a source document that references other maintenance documentation that contains the required EWIS ICA data; or
- Utilize an existing document, such as the MRBR, MPD, or MID.

NOTE: With reference to TCH Service Bulletins (SB) that affect EWIS, the FAA expects that the TCH will identify protections and caution information in a manner or form that conveys the information to the operator. For example, one TCH states in every SB that affects the EWIS this cautionary statement: keep the work area, wires, and electrical bundles clean of metal particles or contamination when you use tools. Unwanted material, metal particles, or contamination caught in wire bundles can cause damage to the bundles. Damaged wire bundles can cause sparks or other electrical damage.

a. Overview. EWIS ICA developed from application of the EZAP should be located in the systems and powerplant section under ATA 20, and the zonal inspection program section of the airplane's MRBR, maintenance planning document, maintenance implementation document, or a source document. They consist of inspection and restoration tasks, task intervals, and instructions/procedures to accomplish the tasks. The inspection can be a zonal GVI, stand-alone GVI, DET, or a combination of these. The TCH selects the task intervals to ensure that operators properly maintain the EWIS, while still allowing flexibility for the operators to schedule maintenance tasks within their maintenance programs. The FAA Oversight Office approves the EWIS ICA.

b. Location.

(1) All EWIS ICA will be in the source document, or the source document will reference other document locations.

(2) Operators must incorporate the FAA Oversight Office-approved EWIS ICA into their maintenance program.

c. Instructions and Procedures.

(1) The FAA Oversight Office-approved instructions/procedures to carry out the EWIS tasks will be contained in the AMM or SWPM/ESPM.

(2) Operators must incorporate these instructions/procedures in their maintenance program/manual and job/task cards. It is especially important that the job/task cards contain all the instructions and procedures that support the EWIS task.

d. Protections and Caution Instructions/Information. The EWIS ICA also includes protections and caution instructions/information that will minimize contamination and accidental damage to EWIS during the performance of maintenance, alterations, or repairs. Inspections of other airplanes after the Boeing 747 and MD-11 accidents showed that contamination of wire bundles with metal shavings, dust, and fluids were common conditions in representative examples of the aging fleet of transport airplanes. These contaminants could damage EWIS and also provide fuel for an electrical fire.

(1) The TCH has developed these protections and caution instructions/information to support the EWIS maintenance program for the airplane. These protections and caution instructions/information will be in the AMM or SWPM/ESPM They are FAA Oversight Office approved. Only those sections are FAA Oversight Office approved, not the entire manual.

(2) It is important that the operator incorporate protections and cautions into its maintenance program/manual to minimize contamination and accidental damage to EWIS when performing maintenance, alteration, or repairs. In addition, the operator should have procedures in its maintenance program/manual that instructs its maintenance personnel “to clean the EWIS and surrounding area after completion of any maintenance, alterations, or repairs.” It is especially important to include the same or a similarly worded statement on the job/task card.

(3) The operator can develop its own instructions and procedures to carry out the EWIS tasks provided the operator developed ones produce an equivalent result to those approved by the FAA Oversight Office and the AMM or SWPM/ESPM allows the use of alternative or equivalent tools or materials. In this case, further approval by the FAA Oversight Office is not required but can be approved by the principal inspector (PI). If the operator proposes to change the instructions and procedures, the supporting technical justification/data must be submitted to and found acceptable by the PI.

(4) The operator is responsible for ensuring that the FAA Oversight Office-approved protections and caution instructions/information are incorporated into its maintenance program/manual and job/task cards and any other documents the operator uses in administering their maintenance program, such as engineering orders/authorizations, as applicable. The operator must have procedures in its maintenance/inspection program/manual that instructs its maintenance program development personnel who write/revise manuals and job/task cards, and engineering personnel who develop/revise engineering orders that all FAA Oversight Office-approved protections and caution instructions/information must be incorporated in those documents as appropriate. It is especially important to include the protections and caution instructions/information on the job/task cards.

(5) Operator-developed job/task cards that include EWIS inspection tasks must have the protections and caution information and instructions included on the job/task cards and it should reference the location in the AMM or SWPM/ESPM. Similarly, engineering orders that affect the EWIS must have protections and caution instructions/information included.

2-7. STC HOLDER-DEVELOPED EWIS ICA.

a. Applicability. Section 26.11 applies to applicants for STCs if the date of application was before December 10, 2007, and the STC was issued on or after that date. The rule also applies to applications for new STCs filed after the effective date of the rule (December 10, 2007). It does not retroactively apply to any STCs installed prior to December 10, 2007.

b. New STC Applications. Section 26.11 requires new or amended STC applications filed after the effective date of the rule to be evaluated and, if necessary, to be developed and the revisions submitted for review and approval by the FAA Oversight Office. However, if an operator develops its own STC which creates new EWIS ICA, the FAA Oversight Office must approve them.

> **NOTE: The operator must submit its STC EWIS ICA as part of the STC package, along with supporting technical justification/data to the FAA Oversight Office for approval.**

2-8. STC LIMITATION. Part 26 does not prohibit issuing an STC even if the STC applicant has not yet met the requirements of that section. In this case, the FAA will add a limitation to the STC. FAA engineering policy memo PS-AIR-100 2007-12-27A, Enhanced Airworthiness Program for Airplane Systems (EAPAS) Supplemental Type Certificate (STC) Limitation, dated July 7, 2008, describes how and when the FAA will do this. You can download an electronic copy at http://rgl.faa.gov/.

a. Limitation Statement. It is important for the operator to understand that this is a limitation on the STC applicant and not the operator. The following statement is added to the Limitation Section of the STC:

> "This modification may not be installed after August 30, 2010 unless (1) previously approved electrical wiring interconnection system (EWIS) instructions for continued airworthiness (ICA) have been evaluated and determined to be adequate for this installation by the FAA, or (2) revised EWIS ICA have been approved by the FAA Oversight Office. (Refer to § 26.11.)"

b. Installation after August 30, 2010. In order for the operator to install the STC after August 30, 2010, the operator will need to have one of the following:

(1) A letter from the FAA Oversight Office stating that the previously approved EWIS ICA have been evaluated and shown to be adequate for the modification. The operator should request this letter from the FAA Oversight Office to ensure that the STC has been evaluated in accordance with § 26.11(c)(1) and (2) prior to installation, or

(2) Revised EWIS ICA that the FAA Oversight Office has approved for the STC modification. The revised EWIS ICA should be provided to the operator by the STC holder.

c. Existing STCs after August 30, 2010. As stated above, this is a limitation on the STC applicant, not on the operator. Operators can continue to operate their airplanes with the existing STC after August 30, 2010. The operator has no obligation under the operation rules

(§§ 121.1111 and 129.111) to develop EWIS ICA for the existing STC. If the STC holder provides EWIS ICA for the previously incorporated STC (STC installed after the effective date of the rule), the operator must incorporate the EWIS ICA into its maintenance program.

> **NOTE: If a STC limitation remains, that STC cannot be installed on previously unmodified airplanes even if an operator operates airplanes that had the design change installed on the same airplane model prior to August 30, 2010.**

2-9. REQUIREMENT TO ENSURE COMPATIBILITY BETWEEN FUEL TANK SYSTEM AND EWIS ICA. Section 26.11 requires a review by the TC and STC holders of any fuel tank system ICA developed to comply with SFAR 88, Fuel Tank System Fault Tolerance Evaluation Requirements. This ensures compatibility with the EZAP-generated EWIS ICA and minimizes duplication of requirements between them (refer to Appendix 2 for more information on EZAP). Fuel tank wiring is part of the aircraft's EWIS. The fuel tank system maintenance and inspection requirements might be more specific than those for wiring in general, and might contain additional requirements.

a. TC and STC Holder Review. The DAH will review ICA to ensure that any maintenance tasks for EWIS do not compromise fuel tank system wire requirements, such as separation or configuration specifications. Operators need to be aware that separation and configuration of EWIS, especially when performing a repair or alteration to the EWIS or fuel tank system wiring, may be critical.

> **NOTE: The FAA Oversight Office must approve any operator-proposed changes to separation and configuration of EWIS or fuel tank system wiring. The operator must submit its proposed changes with supporting technical justification/data through the PI. The PI adds comments (if any) and forwards the proposed changes to the FAA Oversight Office for approval.**

b. Fuel Tank System ICA Location. The TCH will list the EWIS and fuel tank system tasks and intervals in its maintenance program document for the airplane. They are identified as EWIS ICA or EWIS/SFAR 88 ICA. The STC holder will typically list its ICA in the STC document it provides. The FAA Oversight Office approves the TC and STC ICA.

c. Example. The following table is an example of how a TCH has identified an integrated EWIS/SFAR 88 task within its maintenance program documents. STC holders may identify them differently and include them in the ICA section of their documents. Each task is identified as an EWIS task or SFAR 88 task. An integrated task will be identified as a EWIS/SFAR 88 task. Operators must identify the EWIS tasks and the integrated EWIS/SFAR 88 tasks in their maintenance program so as not to lose their identity as part of an approved ICA.

(1) Column 1 identifies the task number, in this case 20-XXX. The task number 20-XXX is only an example for illustration purposes in this AC. An actual TCH task number will probably contain six or more numbers, such as 20-XXX-XX. Some may also be in ATA 28, so the task may be 28-XX-XX.

(2) Column 2 is the task, which is a DET.

(3) Column 3 is the task interval, 6C.

(4) Column 4 is airplane applicability.

(5) Column 5 is a description of the task and, in this case, is an integrated EWIS/SFAR 88 task.

d. Operator-Developed EWIS ICA. The FAA recognizes that some operators may not have maintenance programs developed using MSG-3. These operators can incorporate the TC or STC holder's FAA Oversight Office-approved ICA into their maintenance programs or they can develop their own EWIS ICA using the current edition of AC 25-27.

NOTE: Important information for the operator: If the operator develops its own EWIS ICA, the FAA Oversight Office must approve them. The operator must forward its proposed EWIS ICA through the PI. The PI adds comments (if any) and forwards the proposed EWIS ICA to the FAA Oversight Office for approval. Operators must incorporate the FAA Oversight Office-approved EWIS ICA into their maintenance program.

TABLE 1. INTEGRATED ENHANCED AIRWORTHINESS PROGRAM FOR AIRPLANE SYSTEMS/FUEL TANK SAFETY TASK

1. Item	2. Task	3. Task interval	4. Airplane Applicability	5. Task description
20-XXX *	DET	6C	All	Inspect exposed EWIS/FQIS etc. EWIS/SFAR 88
* paragraphs 2-8c(1)				

CHAPTER 3. OPERATIONAL REQUIREMENTS

3-1. OPERATOR INCORPORATION OF FAA-APPROVED ELECTRICAL WIRING INTERCONNECTION SYSTEM (EWIS) INSTRUCTIONS FOR CONTINUED AIRWORTHINESS (ICA) INTO THE MAINTENANCE PROGRAM. The operational rules in Title 14 of the Code of Federal Regulations (14 CFR) part 121, § 121.1111 and part 129, § 129.111 require operators to incorporate FAA Oversight Office-approved EWIS ICA into their maintenance program. These ICA include inspection and restoration tasks, task intervals, instructions/procedures to accomplish those tasks, and protections and caution instructions/information for the EWIS. The FAA expects that type certificate holders (TCH) will incorporate the approved EWIS ICA into their Maintenance Review Board Report (MRBR) or maintenance implementation document and make them available to operators either electronically or in hard copy. The FAA expects that Supplemental Type Certificate (STC) holders will make them available by similar means.

a. Operator's Tracking System. The operator should establish a tracking system within its maintenance program that tracks the incorporation of and any revisions to FAA Oversight Office-approved EWIS ICA, so the ICA will not lose their identity as FAA-approved EWIS ICA. This includes:

(1) Task and intervals,

(2) Instructions/procedures in the Airplane Maintenance Manual (AMM) and Standard Wiring Practice Manual (SWPM)/Electrical Standard Practices Manual (ESPM), and

(3) Protections and caution instructions/information in the AMM and SWPM/ESPM.

b. Controlling Reference Numbers. TCHs' controlling reference numbers uniquely identify the EWIS ICA for identification and traceability purposes throughout the operational life of the airplane. During the initial incorporation of the EWIS ICA into the operator's maintenance program, the operator should use these controlling reference numbers or an operator-developed system that correlates to them for the purposes of traceability. This will provide operator traceability during future maintenance program changes that contain EWIS ICA. This will help prevent inadvertent deletion, changes to the type of task, or escalation of EWIS ICA without proper consideration of the reason for the task and its interval. The tracking system should correlate to the controlling reference number for the EWIS ICA and be acceptable to the principal inspector (PI).

3-2. OPERATOR CHANGES TO EZAP DEVELOPED EWIS TASK OR TASK INTERVALS.

a. Types of Changes. There are two types of changes to the operator's EWIS maintenance program:

(1) Deletion of or changes to a EWIS task, or

(2) Escalation of an airplane check package/interval, such as "C check" containing EWIS tasks and intervals.

b. FAA Oversight Office Approval. If the operator proposes to delete or change an EWIS task, it must be approved by the FAA Oversight Office. The operator should submit its proposed changes with supporting technical justification/data through the PI. The PI adds comments (if any) and forwards the proposed changes to the FAA Oversight Office for approval.

c. Escalation of an Airplane Check Package/Interval. If the operator proposes an escalation of an airplane check package/interval, such as the "C check" that contains EWIS tasks and intervals, the FAA Oversight Office does not have to approve the change. This change is within the authority of the PI and the procedures in the operator's maintenance program/manual. The operator must provide the PI with technical justification for escalating any EWIS tasks and intervals.

3-3. OPERATOR CHANGES TO EWIS ICA DEVELOPED UNDER 14 CFR PART 25, § 25.1729.

a. Requirements. The following EWIS ICA are required if the airplane has § 25.1729 in its certification basis, or if the FAA Oversight Office has determined that an STC applicant must comply with 14 CFR part 21, § 21.101, Designation of Applicable Regulations, and, therefore, require the applicant to comply with all or parts of the EWIS requirements of § 25.1729.

- Acceptable EWIS maintenance practices in a standard format.
- EWIS ICA such as wiring separation requirements.
- EWIS identification methods and requirements for identifying any changes to EWIS.
- Electrical load data and instructions for updating that data.

b. Approval. Operators should discuss any proposed changes to the EWIS requirements with the PI and FAA Oversight Office to see if the proposed changes are within the authority of the PI and the procedures within the operator's maintenance program, or if they must be approved by the FAA Oversight Office.

3-4. EAPAS MAINTENANCE TRAINING. The Enhanced Airworthiness Program for Airplane Systems/Fuel Tank Safety (EAPAS/FTS) rule introduced new requirements that affect design approval holders (DAH) and operators. To realize fully the objectives of EAPAS/FTS requirements, the FAA encourages operators to rethink their current philosophical approach to maintaining, inspecting, and altering aircraft wiring and systems in the aircraft. The FAA has also adopted the "Protect and Clean as You Go" philosophy. This philosophy stresses:

a. Protective Measures. The importance of protective measures when working on or around wire bundles and connectors, and

b. Debris Removal. The importance of protecting EWIS during structural repairs, STC installations, or other alterations by making sure that metal shavings, debris, and contamination resulting from such work are removed during work in progress and after completion.

c. Operator Training. This philosophical approach begins at the airplane manufacturer with maintenance program enhancements, maintenance manual changes, and maintenance

training programs. In addition, there will be new AMM and job/task card procedures, inspection devices, graphical information showing required tasks, or changes in tasks such as wiring splicing. Operators should provide training to maintenance, inspection, and engineering personnel, including persons who write and edit job cards and engineering orders. The FAA has published AC 120-94, Aircraft Electrical Wiring Interconnection Systems Training Program, to assist operators in development of EWIS training programs.

d. Manufacturer-Developed Training Programs. Operators can also take advantage of any airplane manufacturer-developed training programs that address EWIS.

3-5. OPERATOR'S MAINTENANCE PROGRAM APPROVAL UNDER §§ 121.1111 AND 129.111.

a. Transport Category Airplanes. Operators of transport category airplanes to which §§ 121.1111 and 129.111 apply must incorporate the EWIS ICA into their maintenance program. Sections 121.1111(e) and 129.111(e) require that any EWIS maintenance program changes identified in paragraphs (c) and (d) of those sections and any later revisions must be submitted to the PI for review and approval.

b. Operations Specification (OpSpec)/Management Specification (MSpec) D097. The PI will approve incorporation into the maintenance program by issuing OpSpec/MSpec D097, Aging Aircraft Programs. The operator must use the free text area of the OpSpec/MSpec D097 to identify and record the document(s) by document number, revision number, and date – used as the source of the FAA Oversight Office-approved EWIS/Fuel Tank Safety (FTS) ICA, or if this information is contained in the operator's manual system, a reference to that location in their manual system can be recorded in the free text area.

> **NOTE: The operator must have procedures in its manual that track any changes and approvals made to the FAA Oversight Office-approved EWIS/FTS ICA.**

c. Changes to the Maintenance Program. The operator should handle any changes to its EWIS maintenance program in accordance with this AC.

APPENDIX 1. ACRONYMS

14 CFR	Title 14 of the Code of Federal Regulations
AC	Advisory Circular
ACO	Aircraft Certification Office
AD	Airworthiness Directive
AEG	Aircraft Evaluation Group
AFS	Flight Standards Service
ALS	Airworthiness Limitation Section
AMM	Airplane Maintenance Manual
APU	Auxiliary Power Unit
ASI	Aviation Safety Inspector
A4A	Airlines for America
CMM	Component Maintenance Manual
CWT	Center Wing Fuel Tank
DAH	Design Approval Holder
DET	Detailed Inspection
DOT	Department of Transportation
EAPAS	Enhanced Airworthiness Program for Airplane Systems
EAPAS/FTS	Enhanced Airworthiness Program for Airplane Systems/Fuel Tank Safety
ESPM	Electrical Standard Practices Manual
EWIS	Electrical Wiring Interconnection System
EZAP	Enhanced Zonal Analysis Procedure
FAA	Federal Aviation Administration
FQIS	Fuel Quantity Indicator System
FR	Federal Register
GVI	General Visual Inspection
HQ	Headquarters
ICA	Instructions for Continued Airworthiness
MRB	Maintenance Review Board
MRBR	Maintenance Review Board Report
MSG-3	Maintenance Steering Group – 3rd Task Force
MSI	Maintenance Significant Items
MSpec	Management Specification
NTSB	National Transportation Safety Board
OpSpec	Operations Specification
PI	Principal Inspector
RGL	Regulatory and Guidance Library
SB	Service Bulletin
SFAR	Special Federal Aviation Regulations
STC	Supplemental Type Certificate
SWPM	Standard Wiring Practice Manual
TC	Type Certificate
TCH	Type Certificate Holder
TSB	The Transportation Safety Board of Canada

APPENDIX 2. DEFINITIONS

1. Affected Persons. For the purposes of this advisory circular (AC), operators and others required to comply with the requirements of Title 14 of the Code of Federal Regulations (14 CFR) part 26, § 26.11, part 25, § 25.1729, part 121, § 121.1111, and part 129, § 129.111.

2. Airplane Maintenance Manual (AMM). A manual developed by the manufacturer of a particular airplane that contains information necessary for the continued airworthiness of that airplane.

3. Airworthy. An aircraft, aircraft engine, or component which conforms to its type design and is in safe condition for operation.

4. Component Maintenance Manual (CMM). A manual developed by a manufacturer that contains information necessary for the continued airworthiness of a particular component.

5. Continued Airworthiness. Certified aircraft, engines, propellers, and appliances are safe to operate for the intended purpose; they are maintained safely throughout their service life; the product meets its type design and is in a condition for safe operation.

6. Design Approval Holder (DAH). For the purposes of this AC, a design approval holder is a type certificate holder (TCH), and Supplemental Type Certificate (STC) holder.

7. Electrical Wiring Interconnection System (EWIS). Per § 25.1701, the term EWIS "means any wire, wiring device, or combination of these, including termination devices, installed in any area of the airplane for the purpose of transmitting electrical energy, including data and signals, between two or more intended termination points." (Refer to final rule, Federal Register (FR) Volume 72, Number 216, Subpart H — Electrical Wiring Interconnection Systems (EWIS) Certification Rules, for all 14 items that comprise the entire definition).

8. Enhanced Zonal Analysis Procedure (EZAP). A logical process for developing maintenance and inspection instructions for EWIS.

9. FAA Oversight Office. The Aircraft Certification Office (ACO) or the office of the Transport Airplane Directorate having oversight responsibility for the relevant type certificate (TC) or supplemental type certificate (STC), as determined by the Administrator.

10. Flammable. Per 14 CFR part 1, § 1.1, "flammable, with respect to a fluid or gas, means susceptible to igniting readily or to exploding."

11. Flight Standards Service (AFS). Offices located in Federal Aviation Administration (FAA) headquarters (HQ) responsible for developing guidance and policy applicable to transport category airplanes for Aircraft Evaluation Group (AEG) personnel and Flight Standards Services (AFS) field personnel (maintenance, avionics and operations aviation safety inspectors (ASI)) in the conduct of their responsibilities.

12. Instructions for Continued Airworthiness (ICA). The information developed in accordance with applicable airworthiness requirements that includes the applicable inspection

tasks, intervals, methods, processes, procedures, and airworthiness limitations (AL) to keep the product Airworthy throughout its operational life.

13. Maintenance and Inspection Instructions. Information that provides for each part of the airplane and its engine auxiliary power units (APU), propellers, accessories, instruments, and equipment the recommended periods at which they should be cleaned, inspected, adjusted, tested, and lubricated, and the degree of inspection, the applicable wear tolerances, and work recommended at these periods necessary to provide for the continued airworthiness of the airplane. They also include the recommended overhaul periods and necessary cross-reference to the Airworthiness Limitation Section (ALS) of the manual.

14. Maintenance Implementation Document (MID). A document developed by one aircraft manufacturer that contains a comprehensive list of all EWIS and Fuel Tank Safety (FTS) ICA which will satisfy the requirements contained in the Enhanced Airworthiness Program for Airplane Systems/Fuel Tank Safety (EAPAS/FTS) operational rules.

15. Maintenance Planning Data (MPD). Data developed by the manufacturer of a particular airplane which contain the information each operator of that airplane needs to develop a customized, scheduled maintenance program.

16. Maintenance Review Board Report (MRBR). Intended for air carriers, a report which contains the initial minimum scheduled maintenance and inspection requirements for a particular transport category airplane and on-wing engine program. Air carriers may use those provisions—along with other maintenance information contained in the ICA—in the development of their maintenance programs.

17. Maintenance Steering Group – 3rd Task Force (MSG-3). A voluntary structured process developed by the industry and maintained by the Airlines for America (A4A) to make decisions used to develop maintenance and inspection tasks and intervals for an airplane.

18. Products. Certified aircraft, engines, propellers, and appliances.

19. Representative Airplane's EWIS. For the purposes of the EAPAS/FTS rule, the "representative airplane's" EWIS is the configuration of each model series airplane that incorporates all variations of EWIS used in production on that series airplane and all TCH-designed modifications mandated by Airworthiness Directive (AD) as of the effective date of the rule.

20. STC-Developed EWIS ICA. STC holders may use the Maintenance Review Board (MRB) process or any other process they choose. Regardless of the process used, the end result must be ICA that include the applicable inspection tasks, intervals, methods, processes, and procedures to keep the EWIS Airworthy throughout its operational life.

21. STC EWIS ICA. The inspections and procedures to keep an alteration affecting the EWIS approved under an STC Airworthy throughout its operational life.

22. TCH EWIS ICA. The inspections and procedures to keep EWIS Airworthy throughout its operational life.

23. TCH Original EWIS ICA. The result of the MRB process. During this process, TCH-developed Maintenance Significant Items (MSI) are subjected to maintenance program development logic, such as in MSG-3 or later revisions. The result is an ICA that includes the applicable inspection tasks, intervals, methods, processes, and procedures to keep the EWIS Airworthy throughout its operational life.

APPENDIX 3. FAA OVERSIGHT OFFICES BY AIRPLANE MANUFACTURER

Airplane Manufacturer	FAA Oversight Office
ATR – GIE Avions de Transport Regional	Transport Standards Staff, International Branch, ANM-116
Airbus	Transport Standards Staff, International Branch, ANM-116
BAE	Transport Standards Staff, International Branch, ANM-116
Boeing – Seattle Area	Seattle Aircraft Certification Office ANM-100S and/or Boeing Aviation Safety Oversight Office (ANM-100B)
Bombardier	New York Aircraft Certification Office
CASA	Transport Standards Staff, International Branch, ANM-116
dehavilland	New York Aircraft Certification Office
Dornier	Transport Standards Staff, International Branch, ANM-116
Embraer	Transport Standards Staff, International Branch, ANM-116
Fokker	Transport Standards Staff, International Branch, ANM-116
Lockheed Martin	Atlanta Aircraft Certification Office
Boeing – Long Beach (McDonnell-Douglas)	Los Angeles Aircraft Certification Office
SAAB	Transport Standards Staff, International Branch, ANM-116