

<b>EASA</b>	<b>CERTIFICATION MEMORANDUM</b>
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## **Subject**

**Electrical Wiring Interconnection System**

**Instructions for Continued Airworthiness**

**Log of Issues**

<b>Issue</b>	<b>Issue date</b>	<b>Change description</b>
01	11.01.2013	First issue.

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# 1. INTRODUCTION

## 1.1. PURPOSE AND SCOPE

The purpose of this Certification Memorandum is to provide specific guidance for developing Instructions for Continuing Airworthiness (ICA) with regard to Electrical Wiring Interconnection System (EWIS) for CS-25 large aeroplanes.

This Certification Memorandum determines the applicable requirements to EWIS ICA and describes how an applicant for a Type Certificate (TC), a Major Change / Repair, a Minor Change / Repair, or a Supplemental Type Certificate (STC) should show compliance to CS 25.1729. It provides additional information and guidance to the Acceptable Means of Compliance (AMC) as published in Book 2 of CS-25 and in AMC 20.

## 1.2. REFERENCES

It is intended that the following reference materials be used in conjunction with this Certification Memorandum:

Reference	Title	Code	Issue	Date
CS 25.1729	Instructions for Continued Airworthiness; EWIS	CS-25	5 and up	05-09-2008
Appendix H 25.4(a)(3) 25.5 And the AMC	Instructions for Continued Airworthiness Airworthiness Limitations Section Electrical Wiring Interconnection System Instructions for Continued Airworthiness	CS-25	5 and up	05-09-2008
AMC 20-21	Programme to Enhance Aeroplane Electrical Wiring Interconnection System (EWIS) Maintenance	AMC 20/4	---	05-09-2008
AMC 20-22	Aeroplane Electrical Wiring Interconnection System Training Programme	AMC 20/4	---	05-09-2008
AMC 20-23	Development of Electrical Standard Wiring Practices documentation	AMC 20/4	---	05-09-2008
AC 25-27A	Development of Transport Category Airplane Electrical Wiring Interconnection Systems Instructions for Continued Airworthiness Using and Enhanced Zonal Analysis Procedure	FAR 25	---	04-05-2010

### 1.3. ABBREVIATIONS

The following abbreviations are used in this Certification Memorandum:

<b>Abbreviation</b>	<b>Meaning</b>
<b>AC</b>	<b>A</b> dvisory <b>C</b> ircular
<b>AMC</b>	<b>A</b> cceptable <b>M</b> eans of <b>C</b> ompliance
<b>CS</b>	<b>C</b> ertification <b>S</b> pecification
<b>EASA</b>	<b>E</b> uropean <b>A</b> viation <b>S</b> afety <b>A</b> gency
<b>EWIS</b>	<b>E</b> lectrical <b>W</b> iring <b>I</b> nterconnection <b>S</b> ystem
<b>EZAP</b>	<b>E</b> nhanced <b>Z</b> onal <b>A</b> nalysis <b>P</b> rocedure
<b>FAA</b>	<b>F</b> ederal <b>A</b> viation <b>A</b> dministration
<b>ICA</b>	<b>I</b> nstructions for <b>C</b> ontinued <b>A</b> irworthiness
<b>SC</b>	<b>S</b> pecial <b>C</b> ondition
<b>STC</b>	<b>S</b> upplemental <b>T</b> ype <b>C</b> ertificate
<b>TC</b>	<b>T</b> ype <b>C</b> ertificate
<b>TCDS</b>	<b>T</b> ype <b>C</b> ertification <b>D</b> ata <b>S</b> heet

### 1.4. DEFINITIONS

The following definitions are used in this Certification Memorandum:

<b>Definition</b>	<b>Meaning</b>
EWIS	See CS 25.1701

## 2. BACKGROUND

Traditionally, wire has not been looked at as a system on its own. Wire was not considered to have similar importance for safety as other systems for which it provides the electrical interconnection. Late eighties, concerns were raised regarding the safety of wiring due to some accidents and incidents. The fatal accidents with flight TWA 800 in 1996 and Swissair Flight 111 in 1998 prompted a review of the safety of wiring. The first one, a centre wing fuel tank explosion, was most likely caused by a short circuit outside of the tank that allowed excessive voltage to enter the tank through electrical wiring associated with the fuel quantity indication system. The Swissair accident was a combination of occurrences, amongst them fire in the In-Flight Entertainment System wiring above the cockpit area.

Investigation of the condition of wiring in in-service airplanes showed:

- deteriorated and damaged wiring,
- corrosion,
- wrong installations and repairs,
- contamination with metal parts (i.e. swarf),
- dust and liquids,
- other strange objects (i.e. cutlery or tools).

The identified causes of major accidents and investigation results led to an increased awareness. It also led to improvements in design, certification, training, installation, and maintenance aspects of aircraft electrical wiring. The EASA and the FAA introduced a new rulemaking package for certification and operational rules relating to electrical wiring systems in CS-25, respectively Part 25.

Part of this new rulemaking package concerns the Instructions for Continued Airworthiness, introduced via CS 25.1729, Appendix H 25.4(a)(3) and 25.5, AMC to Appendix H 25.4(a)(3) and 25.5, and AMC 20-21.

The following policy has been developed to give further guidance to TC, Major Changes / Repairs, Minor Changes / Repairs and STC applicants who have to show compliance to this requirement.

## 3. EASA CERTIFICATION POLICY

### 3.1. EASA POLICY

This policy focuses on the compliance finding to CS 25.1729: Instructions for Continued Airworthiness; EWIS. First the new TC applications will be discussed and then Major Changes / Repairs, Minor Changes / Repairs and STC projects.

EASA and FAA have harmonised the rules regarding EWIS for large aeroplanes. The technical content is, apart from some minor differences, completely harmonised. However, the way the rule was imposed retrospectively has been done in different manners. FAA has used Part 26 to make the FAA equivalent of CS 25.1729 EWIS Enhanced Zonal Analysis Procedure (EZAP) ICA development mandatory for existing TCs and (new) applications for STCs. EASA has used regulatory letters to TC holders and applicants for TCs and STCs to impose the CS 25.1729 EWIS EZAP ICA aspects later complemented via a generic Special Condition (SC), referred to as [SC\\_H-01](#), and can be found on the EASA website (via the EWIS ICE Requirements - FAQ page.)

For definitions for design changes and repairs, see Annex I Part 21 to Commission Regulation (EU) No 748/2012, Subpart D, E, and M.

Maintenance activities that are not covered by Subpart M are not considered in this Certification Memorandum.

#### 3.1.1. TC projects

In case of an application for TC that has to comply with CS-25 amendment 5 or higher amendments, all EWIS requirements are applicable. With regard to CS 25.1729 this means that the referenced paragraphs in Appendix H and referenced AMCs in CS 25 book 2, AMC 20-21, AMC 20-22, and AMC 20-23, are fully applicable. The compliance finding to CS 25.1729 covers several topics. AMC to Appendix H 25.4(a)(3) and H 25.5 give more details and makes reference amongst others to:

- Inclusion of mandatory replacement times for EWIS components in the Airworthiness Limitations section of the ICA.
- Maintenance and inspection requirements for the EWIS developed with the use of an EZAP.
- Acceptable EWIS maintenance practices in a standard format (i.e. standard wiring practices manual (SWPM)).
- Wire separation requirements as determined under CS 25.1707.
- Information explaining the EWIS identification method and requirements for identifying any changes to EWIS under CS 25.1711.
- Electrical load data and instruction for updating that data.
- Requirement that the ICA be in the form of document appropriate for the information provided, and easily recognizable as EWIS ICA.

The logical way of dealing with the different activities is by making a compliance certification plan containing the chosen process, means of compliance, and the different expected deliverables. It should be traceable how the applicant is fulfilling the different topics in this requirement.

For the development of EWIS ICA tasks using EZAP, the Agency has published AMC 20-21 as guidance material. This existing guidance material describes the EZAP in further detail. A flow diagram describing the EZAP can be found in Appendix A to the AMC. The corresponding form sheets can be found in Appendix B to the AMC.

### 3.1.2. Major Change / Repair, Minor Change / Repair, STC

For a design change or repair design, the certification basis will be determined according to the applicable rules (laid down in Part 21). Several scenarios could occur regarding the EWIS EZAP as follows:

- If the Type Certification Data Sheet (TCDS) of the affected aeroplane contains CS-25 amendment 5 or higher, the impact on all EWIS paragraphs (CS-25 Subpart H) should be considered. This includes CS 25.1729, and herein referenced regulatory references.
- If the TCDS of the affected aeroplane contains CS-25 on amendment lower than 5 and the EWIS ICA Special Condition H-01 is included: the impact on the EWIS ICA by the proposed change should be considered according to the Special Condition H-01.
- In case one elects to comply with CS-25 amendment 5 or higher, then the whole subpart H is applicable including the complete CS 25.1729 and guidance material to subpart H.
- If the SC H-01 has not yet been introduced into the TCDS and the TCDS is based on an older certification basis than CS-25 amendment 5, the Agency will raise the standard CRI to make the Special Condition H-01 applicable. This only concerns STCs and Major Changes to STC where the affected aeroplane has a maximum type-certificated passenger capacity of 30 or more or a maximum payload capacity of 3402 kg (7500 pounds) or more.

It is reminded that the classification of a change is driven by Part 21.A.91. The fact that EWIS ICA may be revised is not in itself a driver for classification.

The applicant for an STC does not need to voluntarily elect to comply with Subpart H of CS-25 (introduced in amendment 5.) The normal process to establish the certification basis should be followed.

When considering a change, one should keep in mind that not only changes directly related to EWIS can impact on EWIS ICA. A change not directly involving change to EWIS can for instance introduce a new source of possible contamination on existing EWIS components in the affected zone. In that case, the applicant should investigate if the EWIS ICA should be updated, e.g. to incorporate a dedicated task or to change the inspection level.

For the determination on the consequences of the change for EWIS ICA, the applicant should use the flowchart contained in Appendix B to the FAA Advisory Circular (AC) 25-27A instead of Appendix C to EASA AMC 20-21. The revised AC intends, among others, to provide more clarity for applicants seeking approval of a design change when one has no access to the most recent TCH's EWIS EZAP analyses. It means the availability of TCH's EWIS ICA only (without the EZAP analyses), can be sufficient for the STC applicants to assess/develop EWIS ICA for their change. EASA recognises the use of this AC as an acceptable method of compliance for the assessment of design changes. A few general comments should be kept in mind when using this flow chart as guidance:

- The AC 25-27A refers frequently to Part 26. The references within EASA system are the regulatory letters (references are TCH: EASA D (2008) CEXP/PME/82588, and STCH: [EASA D \(2008\) CEXP/PME/84328](#)) and the associated Special Conditions H-01.
- The Agency does not ask for a specific statement on implications to ICA developed because of SFAR 88 programs.
- In the flowchart reference to "FAA Oversight Office or ACO", should be replaced with "EASA".
- The Agency does not require approval of all EWIS EZAP and EWIS ICA. EASA accepts the EWIS ICA in the same manner as for other general ICA.
- In Box 20 of the flow chart, the last bullet ("Restoration (cleaning)") should be deleted. Further down the chart at Box 21 the "yes"-path should guide to a new box containing the question: "Is there an existing cleaning task designated as EWIS ICA that will effectively clean the new combustibles or contaminants introduced by the

modification?" Answering "yes" should guide to Box 22, whereas the answer "no" should guide to Box 23.

The Appendix to this Certification Memorandum is a reproduction of the flowchart contained in Appendix B to AC 25.27A for easy reference.

The first box in the flowchart, Page 1 determines whether the change may have an impact on the existing EWIS ICA. For any change, these five questions already determine if there would be a possible impact by any design change on existing EWIS ICA.

If any of the five questions is answered with "yes", the next step is box 3. This box asks whether the applicant is the TC holder or has access to the most recent EZAP analysis, or all needed details of the design necessary to answer the questions that are asked while performing the EZAP analysis using Appendix A of AC 25-27A. Usually, only the TC holder can answer this question with "yes" and continue with the EZAP analyses dedicated to the design change as given in Appendix A of AC 25-27A. If the designer of a change is not the TC holder, the designer normally does not have access to these kinds of documents. However, he may have access to the TC holders' EWIS ICA that are the result of the EZAP analyses. These EWIS ICA should then be used by the designer of the change (not being the original TC holder) in the following steps of the flow chart following the answer "no" after box no 3.

The flowchart should be applied on every zone affected by the design change separately. The details in each zone considered (e.g. the existing EWIS task from the TC holder) will be different, and can cause a different outcome as such. Therefore the applicant should perform this analysis on every zone.

The flowchart consists of boxes with information on the particular step at hand, boxes asking you to do a certain action or asking questions resulting in a choice "yes" or "no". In order to justify the choices, the applicant should elaborate where applicable on the answers given in the action and question boxes.

At the end there will be new and/or revised EWIS ICA tasks, or the conclusion the existing tasks are adequate. In case of revision / addition of EWIS ICA tasks, these should be made available to the operators.

For design changes that do not require a revision to the existing EWIS ICA, the applicant should submit a statement explaining the rationale for the "no change to EWIS ICA". If the process identifies that new/updated tasks are needed, they should be clearly identified as EWIS ICA tasks. The EWIS ICA should be submitted to EASA as part of the compliance demonstration. Associated justifications are, for instance, a report of the (EZAP) analysis providing an outline of affected zones, reference to the original ICA task(s) that apply to the zone, and/or new/updated tasks as necessary. The report should include a statement of compliance.

Note: The Agency's website also contains a Frequently Asked Questions page with useful information on the subject of EWIS ICA. The web address is: <http://www.easa.eu.int/certification/faq/EWIS-ICA-requirements-FAQ.php>

The reference to this FAQ is provided for information purposes only.

### **3.2. WHO THIS CERTIFICATION MEMORANDUM AFFECTS**

This Certification Memorandum is directed towards large aeroplanes TC, Major Changes / Repairs, Minor Changes / repairs, and STC applications for compliance demonstration related to EWIS ICA.

## 4. REMARKS

1. Suggestions for amendment(s) to this EASA Certification Memorandum should be referred to the Certification Policy and Planning Department, Certification Directorate, EASA. E-mail [CM@easa.europa.eu](mailto:CM@easa.europa.eu) or fax +49 (0)221 89990 4459.
2. For any question concerning the technical content of this EASA Certification Memorandum, please contact:

Name, First Name: BRUSSAARD, Linda

Function: Electrical Systems Expert

Phone: +49 (0)221 89990 4309

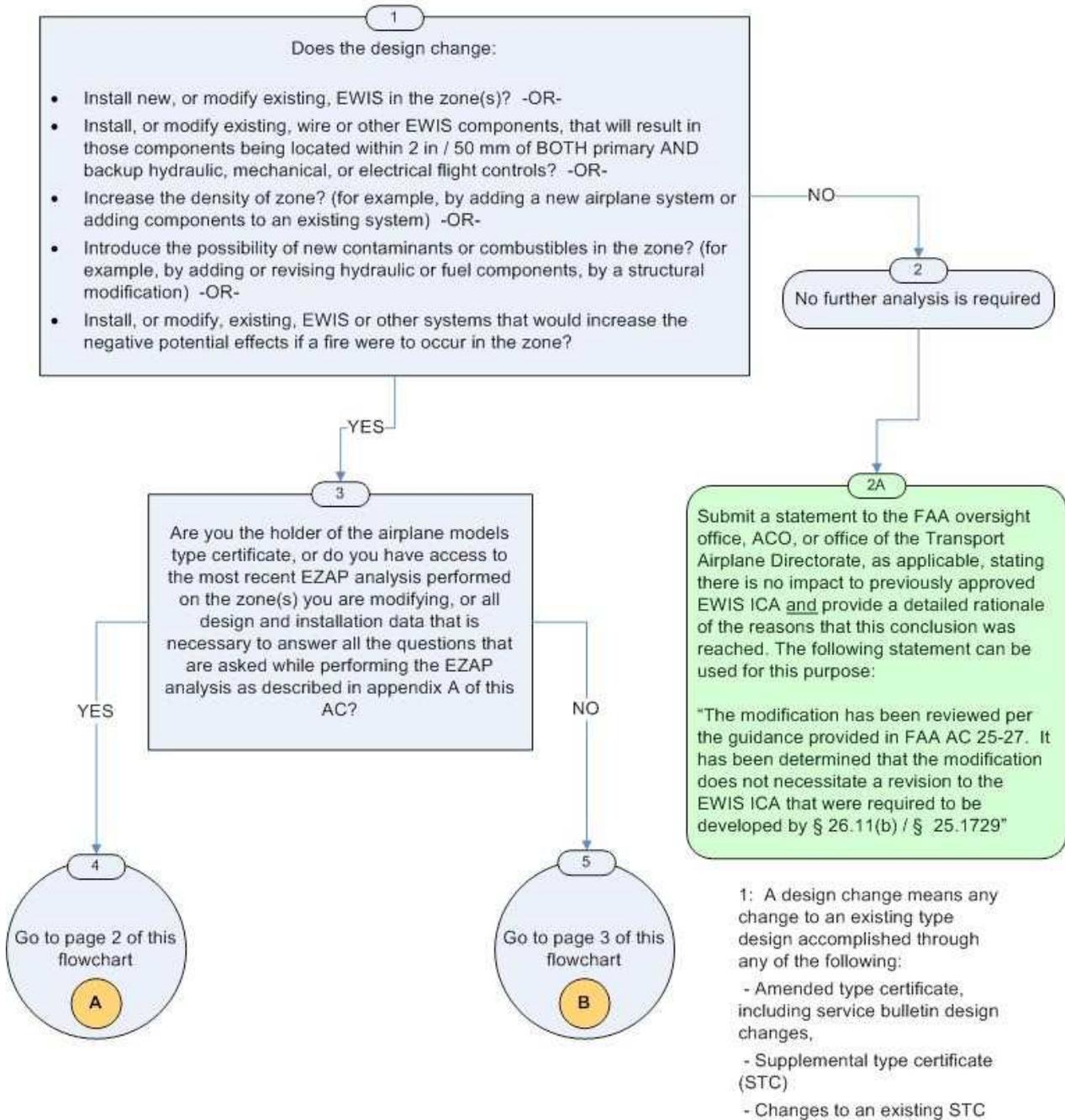
Facsimile: +49 (0)221 89990 4809

E-mail: [linda.brussaard@easa.europa.eu](mailto:linda.brussaard@easa.europa.eu)

# APPENDIX: APPENDIX B TO FAA AC 25-27A

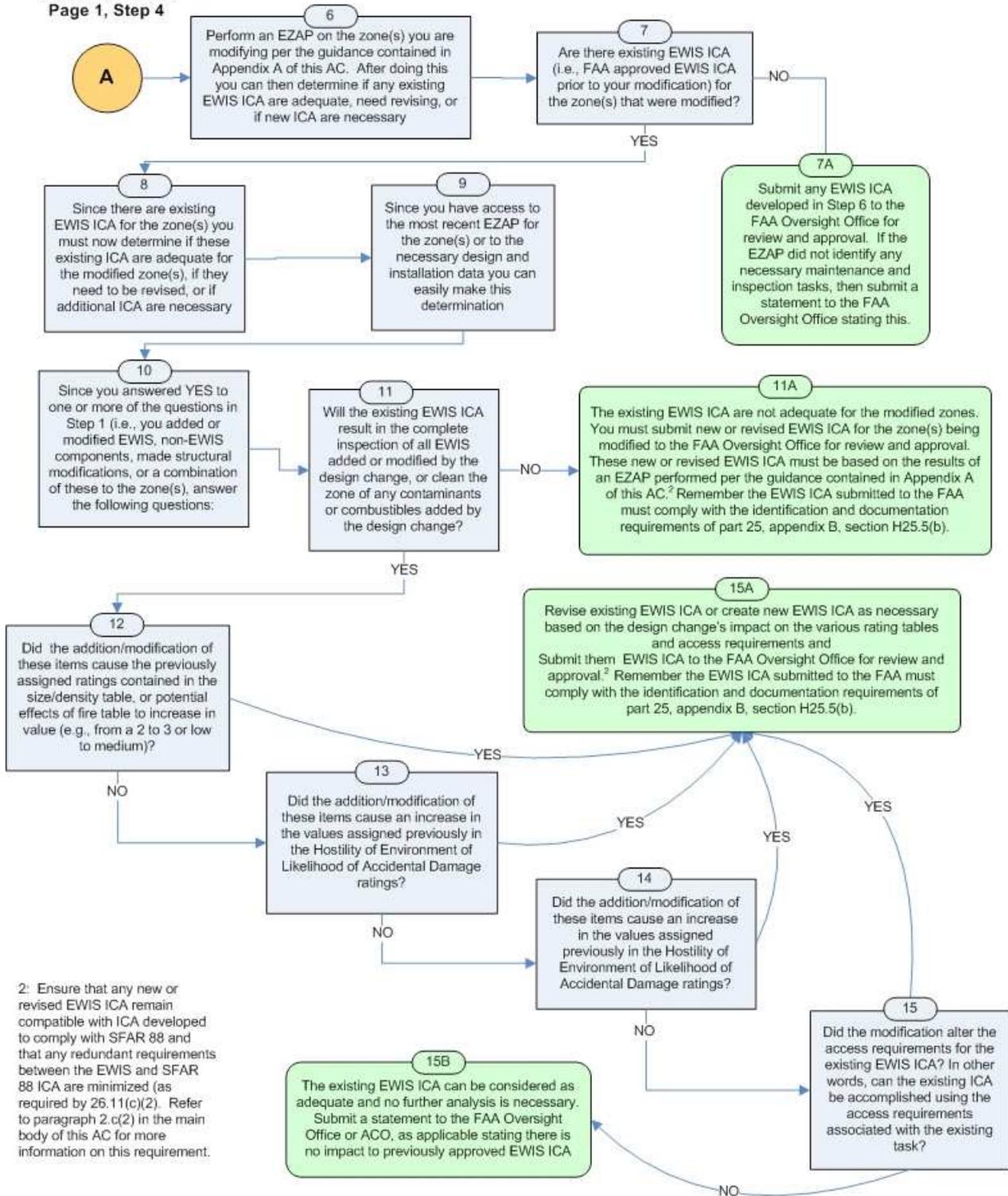
## Flowchart 1

### Development of EWIS ICA for Design Changes <sup>1</sup>

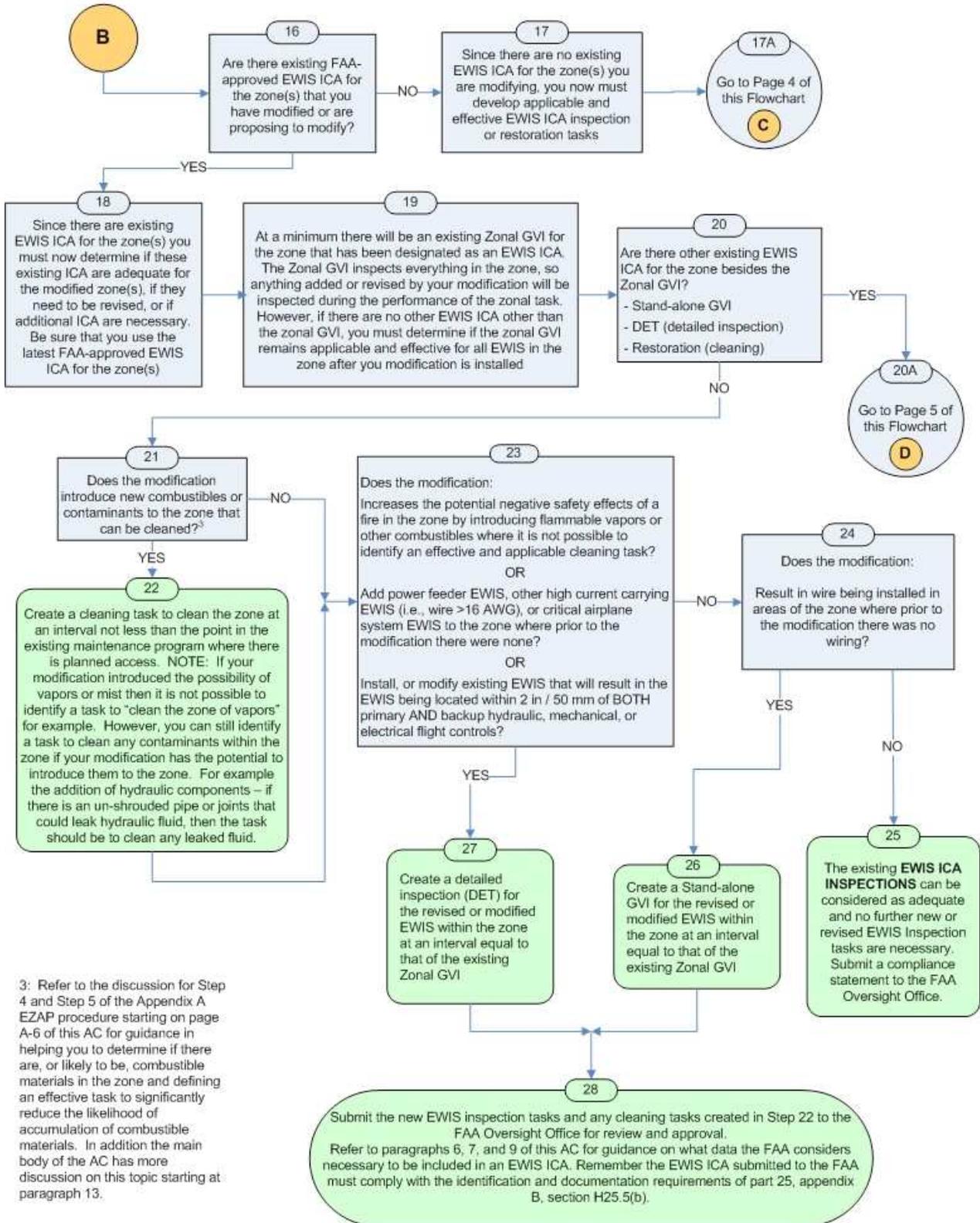


Flowchart 1, Page 2

From Flowchart,  
Page 1, Step 4

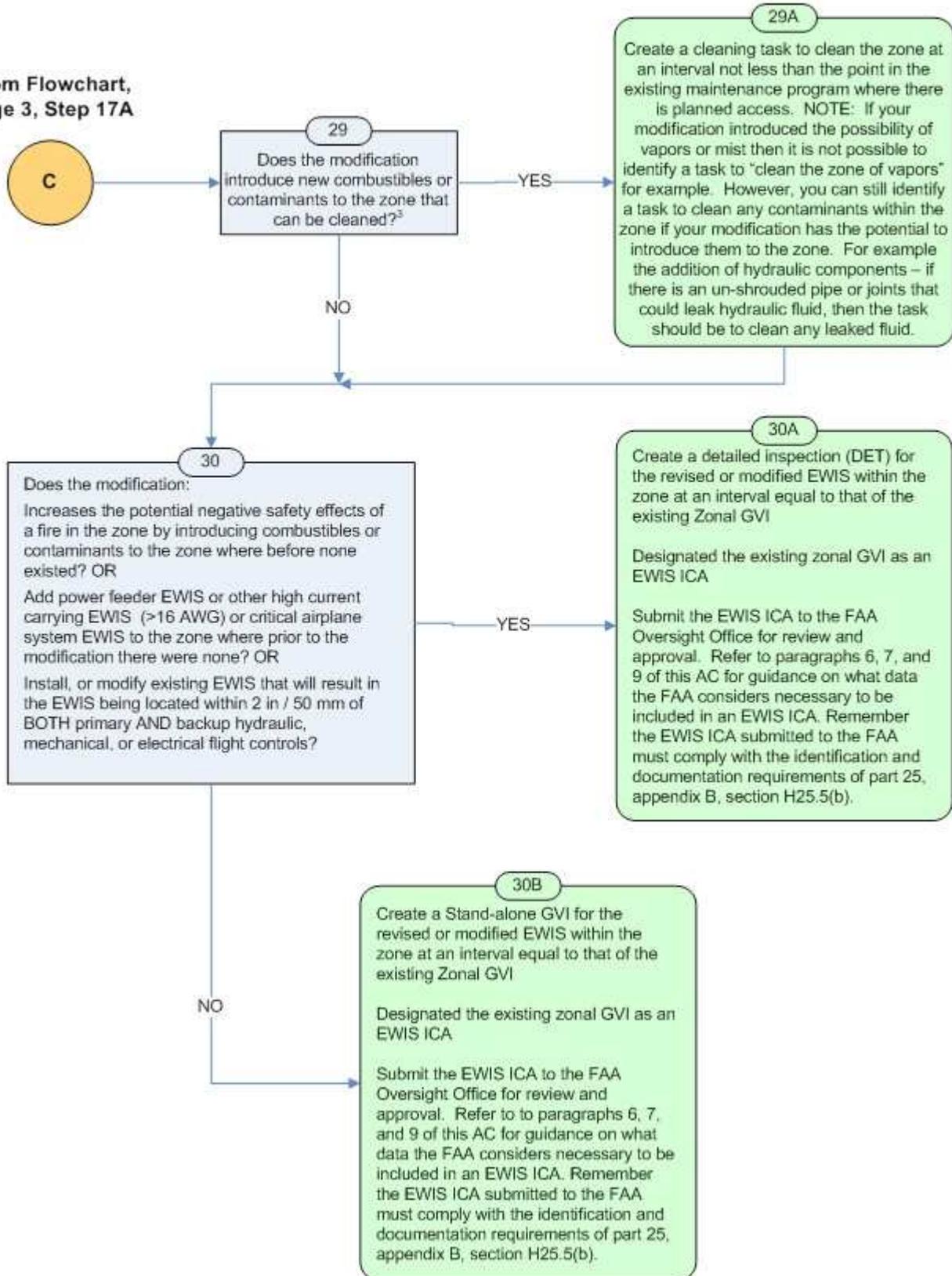


Flowchart 1, Page 3



### Flowchart 1, Page 4

From Flowchart, Page 3, Step 17A



Flowchart 1, Page 5

