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Subject: DAMAGE TOLERANCE
INSPECTIONS FOR REPAIRS AND
ALTERATIONS

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This advisory circular (AC) provides guidance material for Type Certificate (TC) Holders, Supplemental Type Certificate (STC) Holders, and operators to comply with requirements in the Aging Airplane Safety Act to ensure the airworthiness of aging airplane parts and components. The Aging Airplane Safety Rule that supports the Act specifies incorporating damage tolerance-based inspections into an operator's continuous airworthiness maintenance program. These inspections will help ensure the integrity of fatigue critical structure on transport category airplanes operated in air transportation. This guidance will provide persons who have developed repairs and alterations with a means to develop damage tolerance data to be used to determine damage tolerance inspections for repairs and alterations that affect fatigue critical structure. This AC will give guidance on developing compliance documents, schedules and plans that will assist in developing and incorporating damage tolerance inspections into maintenance programs of certain transport category airplanes with respect to repairs and alterations.

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CHAPTER 1. OVERVIEW

100. Purpose.

a. This AC is directed to Type Certificate (TC) and Supplemental Type Certificate (STC) Holders and operators of transport category airplanes. It provides guidance material for developing and incorporating a means for addressing the adverse effects that repairs, alterations and modifications may have on fatigue critical structure. This AC supports TC and STC Holder compliance with Title 14 Code of Federal Regulations (14 CFR) 26.43, *Holders of type certificates – Repairs*; 14 CFR 26.45, *Holders of type certificates – Alterations and repairs to alterations*; and 14 CFR 26.47, *Holders and applicants of Supplemental type certificates – Alterations and repairs to alterations*. These regulations are established in the *Design Approval Holder Damage Tolerance Data Rule*. These regulations require TC Holders and STC Holders to develop certain information needed to support operator compliance with 14 CFR 121.1109 and 14 CFR 129.109, the *Aging Airplane Safety Final Rule* (AASFR) with respect to repairs and alterations. This AC provides guidance for TC and STC Holders to address new and existing repairs and alterations that affect fatigue critical structure (FCS) of the original, as delivered, baseline airplane structural configuration, that is, fatigue critical baseline structure (FCBS). It also provides guidance for repairs that affect FCS of an alteration, referred to in this AC as fatigue critical alteration structure (FCAS).

b. This AC also provides guidance for operators of transport category airplanes to comply with the requirements of the AASFR. Sections 121.1109 and 129.109 require operators' maintenance programs to include a means for addressing the adverse effects repairs, alterations and modifications may have on FCS. To facilitate operator compliance, this AC provides guidance for developing an Operator Implementation Plan (OIP). The OIP will contain the means for addressing the adverse effects of repairs and alterations. Principal Maintenance Inspector (PMI) approval of the OIP constitutes compliance with §§ 121.1109 and 129.109. It should be noted that operators are not required to perform any actions for baseline structure. This is because, for affected airplanes certificated prior to Amendment 25-45, baseline structure is addressed by the Supplemental Structural Inspection Programs (SSIP) mandated by airworthiness directives. The type certification process for airplanes certificated at Amendment 25-45 or later required that damage tolerance-based inspections be established for baseline structure.

c. For the purposes of this AC, the term "alteration" is considered to be synonymous with the term "modification." An alteration is a design change that is made to an airplane; however, various segments of industry have also defined these changes as "modifications." In this AC an alteration is all-inclusive of any design change.

101. Applicability.

a. The guidance provided in this AC is primarily applicable to TC Holders, STC Holders, and operators of transport category, turbine powered airplane models 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 seating capacity of 30 or more; or

- (2)** A maximum payload capacity of 7,500 pounds or more.

The guidance provided in this AC may be used by persons other than TC or STC Holders (for example, third party engineering firms), in support of developing Damage Tolerance (DT) Data on behalf of operators.

b. Like all AC material, this AC is not, in itself, mandatory, and does not constitute a regulation. It describes an acceptable means, but not the only means, for showing compliance with the requirements for transport category airplanes. The Federal Aviation Administration (FAA) will consider other methods of showing compliance that an applicant may elect to present. While these guidelines are not mandatory, we derived them from extensive FAA and industry experience in showing compliance with the relevant regulations. On the other hand, if we become aware of circumstances that convince us that following this AC would not result in compliance with the applicable regulations, we will not be bound by the terms of this AC. We may require additional substantiation or design changes as a basis for finding compliance.

c. This material does not change, create any additional, authorize changes in, or permit deviations from, regulatory requirements.

d. Terms in this AC, such as “shall” or “must” are used only in the sense of ensuring applicability of this particular method of compliance when the acceptable method of compliance described herein is used.

102. Damage Tolerance.

a. Amendment 25-45 to 14 CFR part 25 introduced the use of damage tolerance principles. This approach requires evaluating the structure to determine its crack growth and residual strength characteristics. The evaluation supplies the information necessary to develop a maintenance plan for continued airworthiness. In this AC, a Damage Tolerance Evaluation (DTE) refers to a process that includes analysis and/or tests and service data that lead to the development of a multiple or a single means for determining maintenance actions necessary to detect fatigue cracking that could contribute to a catastrophic failure. Consistent with the guidance provided by this AC, a DTE could entail anything from a rigorous analysis methodology for use by a structures analyst to generic guidelines for operator use. If the DTE concludes that damage tolerance-based supplemental structural inspections are not necessary for a repair or alteration that affects fatigue critical structure, the DTE would provide a summary of those results. In some cases, the DTE may conclude that a repair or alteration, or the FCBS affected by a repair or alteration, needs to be replaced or modified. The DTE documentation will identify the evaluated FCS, the basic assumptions applied in a DTE, and the results of a DTE, which are usually Damage Tolerance Inspections (DTIs). In this AC DTIs are inspections or other maintenance actions developed as a result of a DTE. If the results of the DTE indicate that DTIs are not necessary for a repair or alteration that affects fatigue critical structure, then the DTIs should provide a summary of those results. The DTIs developed as a result of a DTE must comply with the damage tolerance requirement of § 25.571 at Amendment 25-45, or later.

b. Damage Tolerance Inspections (DTIs) are comprised of the following items that may result from a DTE:

- Where to inspect.
- How to inspect.
- How often to repeat the inspection.
- A time limit when the repair needs to be replaced (if necessary).
- If the DTE concludes that DT-based supplemental structural inspections are not necessary, the DTI documentation should include a statement that the normal zonal inspection program is sufficient.

c. For some airplane models, the requirements of the Aging Airplane Safety Final Rule (AASFR) are beyond the scope of the original certification level. For these airplane models, certain information may exist in various FAA-approved documents, such as Supplemental Structural Inspection Documents (SSIDs), repair assessment guideline (RAG) documents, airworthiness limitation sections (ALSs), structural repair manuals (SRMs), service bulletins (SBs), and airworthiness directives (ADs). As stated in the Aging Airplane Safety Interim Final Rule (AASIFR), which was issued on December 6, 2002, FAA-approved SSIDs or RAGs are an acceptable means of compliance with §§ 121.1109(c)(1) and 129.109(b)(1) for the areas covered by those documents. While the methodologies used by TC Holders to develop SSIDs vary, the FAA-approved SSIDs are developed to address fatigue damage in baseline structure.

103. TC and STC Holder Information.

Sections 26.43, 26.45, and 26.47 require, among other things, that the TC and STC Holders develop certain information that will provide the means for operators to address the adverse effects of repairs and alterations. This information must be submitted to the FAA Oversight Office for approval. The information submitted for approval should include the following:

- List of Fatigue Critical Structure:
 - FCBS (TC Holder),
 - FCAS (TC and STC Holder).
- Updated published repair data (TC Holder).
- Repair Evaluation Guidelines (TC Holders) that include:
 - A process operators can use to conduct airplane surveys to enable identification of repairs that affect FCBS.

- A process operators can use to determine how to obtain DTI for those repairs that affect FCBS that are identified in the survey.
- An implementation schedule that provides timelines of airplane surveys and incorporating necessary DTIs into an operator's maintenance program.
- DTIs for alterations that affect FCBS. The DTIs would apply to affected FCBS and any FCAS (TC and STC Holders).
- DTIs for TC or STC Holder repairs they developed for these alterations.
- DTIs for all future repairs and alterations.

104. TC and STC Holder Data Submittal.

- a.** For repairs, TC Holders must submit the list of FCBS and the list of published repair data separately. However, we recommend that this information also be included or referenced in a Compliance Document that should also contain the Repair Evaluation Guidelines.
- b.** For alterations, TC Holders must submit the list of FCAS and any DTI required for their alteration data separately. This includes any DTI required for repair data developed for those alterations. We recommend that this information also be included or referenced in a Compliance Document.
- c.** For alterations, STC Holders must submit a list of FCAS for their STCs. The STC Holders should include DTIs required for their alterations into a Compliance Document. The list of FCAS may be included in or referenced in that Compliance Document.

105. Compliance Documents.

- a.** In order for operators to incorporate means to address repairs and alterations as required by the AASFR, operators should use the information identified in paragraph 103 of this AC to develop an Operator Implementation Plan (OIP). The OIP would be approved by the operators' PMI and be incorporated into their continuous airworthiness maintenance program (CAMP). This AC recommends that TC and STC Holders develop a Compliance Document that contains or references the information operators will need to develop their OIP. As discussed in paragraph 103 and chapters 2 and 3 of this AC, there are certain data that should be included in the Compliance Document which will support FAA review and approval and operators development of their OIP.
- b.** In developing a Compliance Document, the TC and STC Holders should use the guidance material in this AC to identify the information operators will need to support their development of an OIP. This AC recommends that sections be developed within the Compliance Document that address airplane applicability, lists of fatigue critical baseline structure (FCBS) and fatigue critical alterations structure (FCAS), Damage Tolerance Evaluations (DTEs), and Damage Tolerance Inspections (DTIs). A TC Holder's Compliance Document should also include a section that addresses the elements of its

Repair Evaluation Guidelines (REGs). While this AC recommends that the information comprising the REGs be submitted to the FAA as part of the Compliance Document, the TC Holder may submit the REGs information in a separate document for approval and reference that document in the REGs section of the Compliance Document.

c. TC Holders may incorporate the compliance documentation for both repairs (see paragraph 201 of this AC) and alterations (see paragraph 301 of this AC) into a single Compliance Document, or develop a separate Compliance Document for each.

d. TC Holders, STC Holders, operators and civil aviation airworthiness authorities should work together to develop model-specific Compliance Documents with oversight provided by those authorities and assistance from the Aviation Rulemaking Advisory Committee's (ARAC) Airworthiness Assurance Working Group (AAWG). We anticipate that TC Holders will utilize structural task groups (STG) to support their development of model-specific Compliance Documents. The assistance provided by the AAWG is in accordance with an FAA tasking to ARAC (69 FR 26641, May 13, 2004).

(1) The goal of this tasking was the development of guidance material for repairs and alterations affecting FCS. This AC contains the guidance developed by ARAC in accordance with the FAA tasking. In previous aging airplane program development activities, ARAC's AAWG formed model-specific STGs to develop programs for those models. Task 4 of the FAA's tasking to ARAC addresses the model-specific STGs by requiring ARAC's AAWG to oversee the STG activity to ensure uniform application of this AC guidance material. Where necessary, an STG for this activity should be formed and tasked to develop the model-specific Compliance Document. We anticipate that both repairs and alterations can be addressed in the same STG meetings. This joint effort between the TC Holder and operators will help to ensure that operators will have access to the DTIs required for any installed repairs and alterations developed by the TC Holder that affect FCBS. In accordance with the tasking, the AAWG will "Oversee the Structural Task Group (STG) activities that will be coordinated for each applicable airplane model by the respective TC Holders and part 121 and 129 operators. These STG activities will involve developing model-specific approaches that support compliance with §§ 121.1109 and 129.109 under the guidance material supplied in Task 1 of the FAA tasking to ARAC."

(2) In addition to the STG meetings chaired by the TC Holder, it may be beneficial for certain STC Holders to establish an STG for their alteration(s). This would allow the STC Holder to coordinate the development of DT Data for the STC Holder's alteration with affected operators.

e. TC and STC Holders should submit the data required by §§ 26.43, 26.45, and 26.47, and the Compliance Document recommended by this AC to the FAA Oversight Office for approval and make the approved Compliance Document available to operators. Note that certain data required by §§ 26.43, 26.45, and 26.47 may be submitted as part of the Compliance Document submittal. The primary reason for separate submittals is due to different submittal dates required by the part 26 rules. The Compliance Document is the last document submitted and can serve as an all inclusive document that supports operators in developing their OIPs for compliance with the AASFR. Data submitted earlier, such as

the list of FCBS, which must be made available to the operators before the Compliance Document is submitted, may also be included in the Compliance Document. As a minimum, data that must be made available to the operators should be referenced in the Compliance Document.

106. TC Holder Tasks - Repairs. The following is an overview of the tasks for repairs that may affect FCBS. These tasks are further developed in Chapter 2 of this AC. These tasks are necessary to support a TC Holder's timely compliance with § 26.43 and an operator's compliance with §§ 121.1109 and 129.109.

- a. Identify the affected airplane model, models, airplane serial numbers, and design service goal stated as a number of flight cycles, flight hours, or both.
- b. Identify the certification level.
- c. Identify and develop a list of the FCBS.
- d. Submit the list of FCBS to the FAA Oversight Office for approval, and make it available to operators.
- e. Review and update published repair data as necessary.
- f. Submit any new or updated published repair data to the FAA Oversight Office for approval, and make it available to operators.
- g. Revise existing Repair Assessment Guidelines (RAGs) or develop new RAGs, as determined necessary, and submit them to the FAA Oversight Office for approval, and make them available to operators.
- h. Develop Repair Evaluation Guidelines (REGs), and submit them to the FAA Oversight Office for approval, and make the approved REGs available to operators. We anticipate that the REGs will be submitted as part of the Compliance Document.
- i. Prepare a Compliance Document that contains or references the REGs and any other information necessary to support operators in developing their OIPs.
- j. Submit the Compliance Document to the FAA Oversight Office for approval, and make it available to operators.

107. TC and STC Holder Tasks – Alterations and Repairs to Alterations. The following is an overview of the TC and STC Holder tasks necessary for alterations that affect FCBS. This overview also includes TC and STC Holder tasks necessary for repairs that may affect any FCS of the subject alterations. These tasks are applicable to those alterations that have been developed by the TC or STC Holder and are further developed in Chapter 3 of this AC. These tasks are necessary to support TC Holder compliance with § 26.45, STC Holder compliance with § 26.47, and operator compliance with §§ 121.1109 and 129.109.

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- a.** Establish a list of alterations that may affect FCBS. From that list establish a list of alterations that may contain FCS.
- b.** In consultation with operators, determine which airplanes have those alteration(s) installed.
- c.** STC Holders should obtain a list of FCBS from the TC Holder for the airplane models identified in paragraph 101, above.
- d.** STC Holders should identify:
 - Alterations that affect FCBS, or
 - Alterations that contain FCS.
- e.** Determine if DT Data exist for the identified alterations.
- f.** Develop additional DT Data, if necessary.
- g.** Establish an implementation schedule for alterations.
- h.** Review existing DT Data for repairs made to alterations that affect FCBS.
- i.** Develop additional DT Data for repairs made to alterations that affect FCBS.
- j.** Establish an implementation schedule for repairs made to alterations.
- k.** Prepare a Compliance Document, submit it to the FAA Oversight Office for approval, and make it available to operators.

108. Compliance Plans. TC and STC Holders are required by § 26.49 to submit a Compliance Plan to the FAA Oversight Office. This plan will detail the TC or STC Holder's means of compliance with §§ 26.43, 26.45, and 26.47. Specific details of the acceptable contents of a Compliance Plan and procedures for submission to the FAA are described in AC 26-1, Part 26, Continued Airworthiness and Safety Improvements, which may include:

- a.** A project schedule identifying all major milestones, including but not limited to a:
 - (1)** Schedule for submitting the list of FCBS or FCAS as applicable,
 - (2)** Schedule for submitting a list of published repair data,
 - (3)** Schedule for submitting updated published repair or alteration data as applicable,
 - (4)** Schedule for submitting REGs, and
 - (5)** Schedule for establishing the Structures Task Group (if applicable).

- b.** A proposed means of compliance, including but not limited to:
 - (1)** Method(s) for submitting data (for example, separate documents or a Compliance Document),
 - (2)** Establishing the list of FCBS or FCAS,
 - (3)** Performing a DTE and developing DTIs for published repair data and alteration data. If the TC Holder plans to use a streamlined process for determining which of its service bulletins would require the development of new DT Data, that process should be included in the compliance plan.
 - (4)** Developing REGs, and
 - (5)** Making applicable data available to affected operators and STC Holders.
- c.** A plan for submitting a draft of all required compliance items for review by the FAA Oversight Office not less than 60 days before the applicable compliance date.

109. Operator Tasks – Repairs, Alterations, and Repairs to Alterations. The following is an overview of the operator tasks that are further developed in Chapter 4 of this AC.

- a.** Review the applicable Compliance Documents that contain information to support operator compliance with §§ 121.1109 and 129.109. These documents are developed by the TC and STC Holder and are approved by the FAA Oversight Office. Upon approval, the TC and STC Holder are required to make the Compliance Documents available to operators.
- b.** Obtain or develop additional DT Data for alterations not addressed by the applicable Compliance Document.
 - (1)** Identify alterations that exist in the operators' fleet that affect FCBS.
 - (2)** Identify and contact the TC or STC Holder for the applicable alteration and request DT Data for the alteration. If the TC or STC Holder no longer exists or is unable to make the data available it becomes the responsibility of the operator to develop or obtain the DT Data using the guidance contained in Chapter 4 of this AC. For alterations not developed by a TC or STC Holder, it is the responsibility of the operator to obtain the necessary DT Data for that alteration.
- c.** Develop an Operator Implementation Plan (OIP) that contains the information described in paragraph 402 of this AC. The information in the OIP should provide the basis for operator compliance with §§ 121.1109 and 129.109. With respect to repairs and alterations, because the OIP will provide the means by which the operator will comply with §§ 121.1109 and 129.109, it is necessary that the operator coordinate development of the OIP with its PMI.
- d.** Submit the OIP to the PMI for approval.
- e.** Incorporate the OIP into the maintenance program.

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110. Airplane Models Not Requiring Additional DT Data. For certain airplane models certified to Amendment 25-45, or later, the TC or STC Holder may not need to develop additional DT Data. The TC or STC Holder, in coordination with the operators of a given airplane model, may determine that DT Data have been developed for repairs and alterations installed on the operators' airplanes, and that all repair and alteration data published by the TC or STC Holder (for repairs and alterations affecting FCBS) have had a DTE accomplished. For such cases where additional DT Data is not necessary, the TC or STC Holder will still need to substantiate this conclusion for the FAA Oversight Office and develop a Compliance Document. The airplane model-specific Compliance Document would include a statement that operators do not need additional DT Data from the TC or STC Holder to support compliance with the AASFR. In these cases, the information provided in the TC or STC Holder's Compliance Document will support an operator's demonstration to its PMI that its existing maintenance program meets the intent of the AASFR, relative to alterations that affect FCBS.

111. thru 199. [RESERVED].

CHAPTER 2. TC HOLDER TASKS FOR REPAIRS

200. General Information About This Chapter. This chapter provides guidance to TC Holders for developing processes, DT Data, and schedules that will enable operators to develop a means for addressing the adverse effects of repairs as required by §§ 121.1109(c)(2) and 129.109(b)(2). The final product of this guidance will be a document containing these processes, data, and timelines. This document is called the TC Holder Compliance Document and will be approved by the FAA Oversight Office. The guidance in this chapter applies to new and existing repairs installed on an airplane's baseline structure. For repairs installed on structure that has been altered by persons other than a TC Holder, the operator is responsible for coordinating development of the required DT Data with the party responsible for the type design of the alteration. Guidance for addressing alterations and repairs to alterations is provided in Chapter 3 of this AC.

201. Compliance Document Contents. The Compliance Document developed by the TC Holder will be used by operators to develop their Operator Implementation Plan (OIP). In order for the OIP to fulfill the requirement for a means to address adverse affects of repairs on FCBS, the following should be included in the Compliance Document.

- a.** A section entitled "Airplane Information" that contains specific airplane model, series, airplane serial number, certification amendment level, and design service goal.
- b.** A section entitled "FCBS" containing the FAA-approved list of FCBS or a reference to where this list is located.
- c.** A section entitled "DTI for Published Repair Data" that contains:
 - (1)** A list of published repair data that includes repairs that would affect FCBS when installed.
 - (2)** A list of published repair data that have had a DTE performed.
 - (3)** A list of published repair data that has been updated as a result of a DTE to incorporate DTI.

NOTE: If the results of the DTE indicate that supplemental inspections are not required, the DTI documentation should provide a summary of those results. If the DTE concludes that supplemental inspections are not required for a repair, the published repair documentation should provide such information to support operator compliance with the AASFR.

- d.** A section entitled "Repair Evaluation Guidelines" that contains or references:
 - (1)** A process operators can use to conduct airplane surveys, which includes:
 - (a)** Documentation of repairs; and

- (b)** Identification of repairs that affect FCBS.
- (2)** A process operators can use to determine how to obtain DTI for those repairs identified in the survey that affect FCBS.
- (3)** An implementation schedule for existing repairs that provides timelines for the following:
 - (a)** An operator conducting the airplane survey(s);
 - (b)** TC Holder making the DTI for repairs available to operators (if the operator obtains DTI from the TC Holder); and
 - (c)** Operator incorporating into the airplane maintenance program the DTI for repairs that affect FCBS identified in the airplane survey.

Figure 1, below, shows the process for producing a Compliance Document for repairs that affect FCBS.

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TC Holder Tasks for Repairs

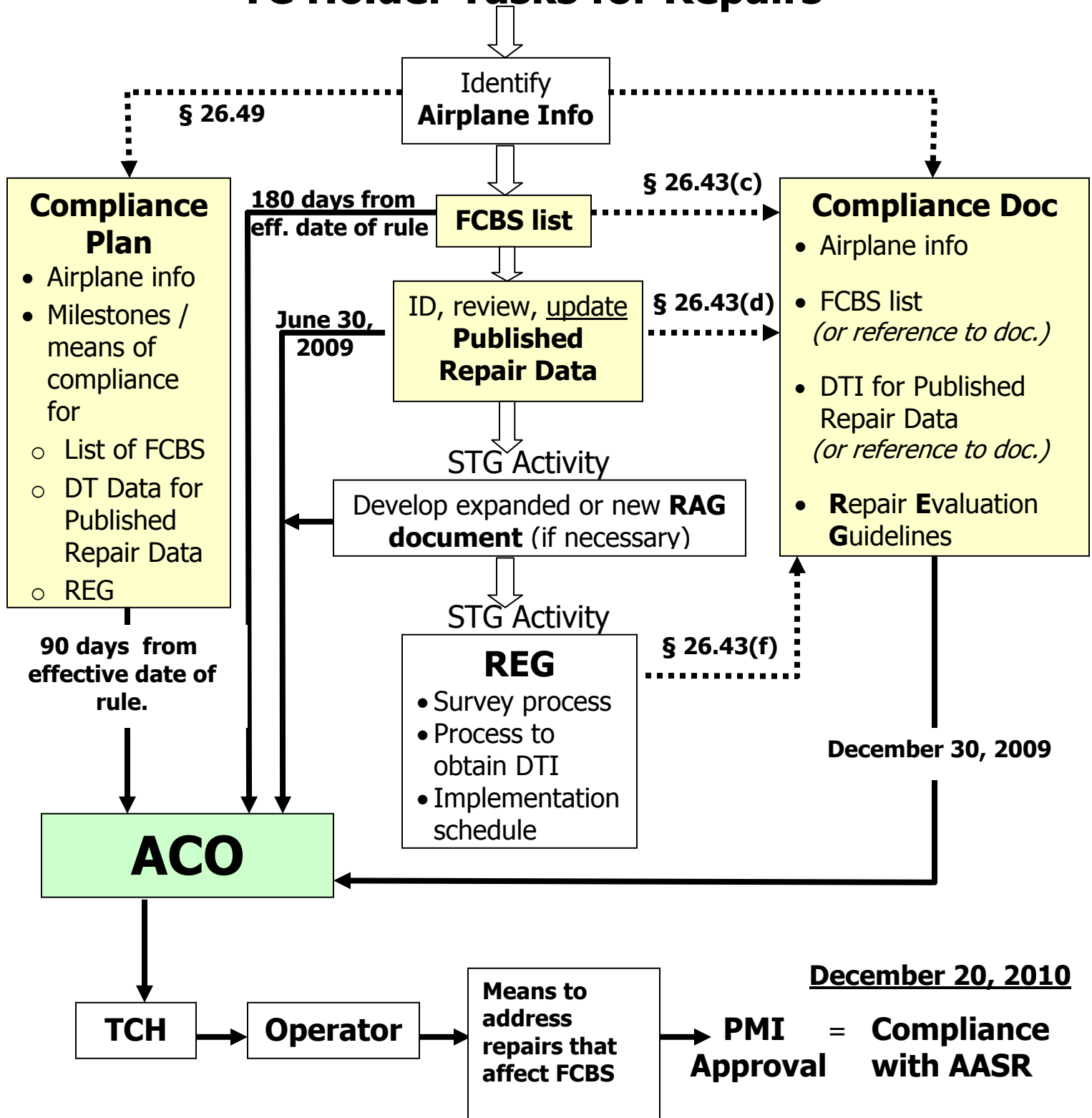


Figure 1 - TC Holder Tasks for Repairs

202. Applicability. The airplane make, model, model variations or serial numbers, gross weights, certification amendment level, and design service goal (DSG) should be identified in the Compliance Document. For each model of airplane, the TC Holder will identify the DSG and work with the operators (see paragraphs 105d and 201a of this AC) to identify the information operators will need for compliance with parts 121 and 129. The established DSG for a particular airplane type should be representative of the airplane, considering the probable variation of the number of flight hours per cycle that could exist in the fleet.

203. Certification Level. In order to understand what data are required, the TC Holder should identify the amendment level of the original certification relative to § 25.571. The amendment level is useful in identifying what DT Data may be available and what standard should be used for developing new DT Data. The two relevant airplane groups are:

- a. Group A** - Airplanes certified to CAR 4b or § 25.571, prior to Amendment 25-45. These airplanes were not evaluated for damage tolerance as part of the original type certification. Therefore, the requirements of the AASFR are beyond the scope of the original certification amendment level. Unless previously accomplished, existing and future repairs to FCBS will need DT Data developed.
- b. Group B** - Airplanes certified to § 25.571, Amendment 25-45 or later. These airplanes were evaluated for damage tolerance as part of the original type certification. Repairs to these airplanes will need to meet their certification level. Some of these repairs may not have repair data that includes DTI and the TC Holder and operators may need to identify and perform a DTE of these repairs and develop DTI.

204. Identifying Fatigue Critical Baseline Structure (FCBS). TC Holders must identify and make available a list of baseline structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. The term “baseline” refers to the structure that is designed under the original type certificate or amended type certificate for that airplane model (that is, the as delivered airplane model configuration). Guidance for identifying this structure can be found in AC 25.571-1C, *Damage Tolerance and Fatigue Evaluation of Structure*, dated April 29, 1998, or current revision. This structure is referred to as “fatigue critical baseline structure.” The purpose of requiring identification and listing of fatigue critical structure (FCS) under the Design Approval Holder DT Data Rule is to provide operators with a tool that will help in evaluating existing and future repairs or alterations. In this context, fatigue critical structure is any structure that is susceptible to fatigue that could contribute to a catastrophic failure, and should be subject to a damage tolerance evaluation (DTE). The DTE would determine if DTIs need to be established for the repaired or altered structure. For the purpose of this AC, structure that is altered after airplane delivery from the TC Holder is not considered to be “baseline” structure.

- a.** The intent of the AASFR is to address the same structure that is required to be evaluated for damage tolerance for original type design compliance with § 25.571. Section 25.571(a) states “An evaluation of the strength, detail design, and fabrication must show that catastrophic failure due to fatigue...will be avoided throughout the operational life of the airplane. This evaluation must be conducted...for each part of the structure which could contribute to a catastrophic failure (such as wing, empennage, control surfaces, fuselage,

engine mounts, and their related primary attachments)....” When identifying FCBS, it is not sufficient to consider only that structure identified in the supplemental structural inspection document (SSID) or airworthiness limitation section (ALS). Some SSIDs or ALSs might only include supplemental inspections of the most highly stressed elements of the FCBS. A SSID and ALS often refer to this structure as a Principal Structural Element (PSE). If repaired, other areas of structure not identified as a PSE in the SSID or ALS may require supplemental inspections. The term PSE has, at times, been applied narrowly by industry. The narrow application of the term PSE could incorrectly limit the scope of the structure that would be considered relative to fatigue if repairs or alterations exist or are subsequently made. The relationship between PSE and FCS could vary significantly depending on the TC Holder’s working definition of PSE. In addition, there may be structure whose failure would be catastrophic, but due to low operational loads on the part, the part will not experience fatigue cracking. However, if the subject part is repaired or altered, the stresses in the part may be increased to a level where it is now susceptible to fatigue cracking. These types of parts should be considered as FCS.

b. TC Holders must develop the list of FCBS (§ 26.43(b)) and include the locations of FCS and a diagram showing the extent of FCS, and submit it to the FAA Oversight Office for review and approval by the date specified in § 26.43(f)(1). Upon approval, the TC Holders must make the list available to STC Holders and to operators. While the list will be submitted to the FAA before the Compliance Document submittal, the list or a reference to the list should also be included in the Compliance Document.

205. Certification Standard Applied When Performing a DTE. When developing DT Data, the certification level of the affected airplane determines the standard for performing the DTE. For Group A airplanes, as identified in paragraph 203 of this AC, the TC Holder should use the requirements of § 25.571, at Amendment 25-45, as a minimum standard. For Group B airplanes, the TC Holder should use the requirements that correspond to the original certification level as a minimum standard. For each repair requiring a DTE, the TC Holder must apply the minimum standard when developing the new DT Data required by § 26.43(c). The TC Holder may use the guidance included in AC 25.571-1C, as revised, or the revision level of that AC which is consistent with the certification amendment level. The certification standard applied by the TC Holder in performing a DTE for repairs should be provided in the model-specific Compliance Document.

206. Performing a DTE on a Repair That Affects FCBS.

a. When performing a DTE on a repair that affects FCBS, the DTE would apply to the affected FCBS and repair. This may consist of an individual analysis or the application of a DT-based process such as Repair Assessment Guidelines that would be used by an operator. The results of the DTE should lead to developing DTIs that address any adverse effects the repair may have on the FCBS. If the DTE results determine that DTIs are not required to ensure the continued airworthiness of the affected FCBS, the TC Holder should note that in the DTE documentation.

b. The term “adverse effects” refers to a degradation in the fatigue life or inspectability of the affected FCBS. Degradation in fatigue life may result from an increase in loading, while degradation of inspectability may result from physical changes made to the structure. The

DTE would be performed within a time frame that ensures the continued airworthiness of affected FCBS.

207. Review of Published Repair Data. Published repair data are generally applicable instructions for accomplishing repairs, such as those contained in structural repair manuals (SRMs) and service bulletins (SBs). These data are approved for general application to a particular airplane model or airplane configuration. TC Holders publish repair data in SRMs, SBs, or equivalent types of documents. Since operators use these data for most repairs, providing DTI in these documents would enable them to comply with the AASFR for most existing and future repairs. Section 26.43(c), *Existing and future published repair data*, requires the TC Holder to review its repair data and identify each repair that affects FCBS. For each such repair, unless previously accomplished, the TC Holder must perform a DTE and develop any necessary DTI for the affected FCBS and repair data. This DTI will provide operators a means for addressing these repairs for compliance with the AASFR. For some repairs, the results of the DTE will conclude that no new DTI will be required for the affected FCBS or repair. For these cases, the TC Holder should provide a means that informs the operator a DTE was performed for the subject repair. This may be accomplished, for example, by providing a statement in a document, such as an SRM, stating that all repairs contained in this manual have had a DTE performed. This should preclude operators from questioning those repairs that do not have DTIs. To support TC Holder compliance with § 26.43(c), the TC Holder should include a list of its published repair data in the Compliance Document and a statement that a DTE has been performed on this data. The following examples of published repair data developed by the TC Holder must be reviewed and included in this list:

- a. SRMs,
- b. SBs,
- c. Documents containing AD mandated repairs, and
- d. Other documents available to operators (for example, airplane maintenance manuals and component maintenance manuals) containing approved repair data.

208. Developing DT Data for Existing Published Repair Data. As described in paragraph 207, above, the TC Holder must perform a DTE for all repairs specified in its existing published repair data that affect FCBS. To accomplish this, the TC Holder will need to review its published repair data and identify repair data that would affect FCBS. Once those repairs are identified, the TC Holder will need to determine if new DT Data will need to be developed for the FCBS affected by the repair and for the repair itself. In the Compliance Plan, the TC Holder should describe the process used to ensure a DTE will be performed for repairs contained in existing published repair data that affect FCBS. In the Compliance Document, the TC Holder should include the new DTI developed for published repair data or make reference to those published repair documents that are new or have been updated to include DTI for compliance with § 26.43(c).

- a. **SRMs.** The TC Holder should review the repair data contained in each SRM and identify repairs that affect FCBS. For these repairs, the TC Holder will need to determine if

the SRM needs revising to comply with § 26.43(c). In determining the extent to which an SRM may need to be revised for compliance, consider the following:

- (1) Whether the existing SRM contains an adequate description of DTIs for the specific model.
- (2) Whether normal maintenance procedures (for example, the inspection threshold and/or existing normal maintenance inspections) are adequate to ensure the continued airworthiness (inspectability) equal to the unrepaired surrounding structure.
- (3) Whether SRM Chapter 51 standard repairs have a DTE.
- (4) Whether all SRM specific repairs affecting FCBS have had a DTE performed.
- (5) Whether there is any guidance on proximity of repairs.
- (6) Whether superseded repairs are addressed and how a DTE is performed for future superseded repairs and how any DTI will be made available.

b. SBs. The TC Holder should review the repair data contained in its SBs and identify those repairs that affect FCBS. For those repairs, the TC Holder should then determine if a new DTE will need to be performed for compliance with § 26.43(c). The compliance plan described in paragraph 108 of this AC should include the description of the process the TC Holder will use to determine which SBs would require development of new DT Data. This review may be done in conjunction with the review of SBs for alterations that affect FCBS that is described in Chapter 3 of this AC.

NOTE: Alterations and repairs to alterations are addressed in Chapter 3 of this AC.

c. ADs. The TC Holder should review ADs that provide maintenance instructions to repair FCBS and determine if the instructions include any necessary DT Data. While the maintenance instructions supporting ADs are typically contained in SBs, other means of documentation may be used.

d. Other Forms of Data Transmittal. In addition to SRMs, SBs, and documentation for ADs, the TC Holder should review any other documents (for example, airplane maintenance manuals and component maintenance manuals) that contain repair data.

209. Developing DT Data for Future Published Repair Data. Section 26.43(c) requires TC Holders to perform a DTE and develop DTIs for all future repair data that affect FCBS. Future repair data refers to data published after the effective date of § 26.43.

210. Submittal of DT Data Developed For Existing Published Repair Data. For existing published repair data described in paragraph 208 of this AC that require new DT Data for repairs affecting FCBS, the TC Holder must submit the new DT Data to the FAA Oversight Office for approval by June 30, 2009 (§ 26.43). The DT Data for future published repair data

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may be approved by an FAA Designee as coordinated with and authorized by the FAA Oversight Office.

211. Submittal of DT Data Developed For Future Published Repair Data. The TC Holder must submit the DT Data to the FAA Oversight Office for approval. The DT Data for future published repair data may be approved by a FAA Designee, as coordinated with and authorized by the FAA Oversight Office. Repair data without DT Data will not be approved by the FAA.

212. Documentation of DT Data Developed for Published Repair Data. In the compliance plan, the TC Holder should include the means used to document any new DTIs developed for published repair data as required by § 26.43(c) (see paragraph 208 of this AC). The Compliance Document should include the new DTI or reference documents containing the DTIs. For example, in lieu of revising individual SBs, the TC Holder may choose to establish a collector document that would contain new DTIs developed and approved for specific repairs contained in various SBs. Documents containing DTIs developed for compliance with the Design Approval Holder DT Data Rule would be made available to operators upon FAA approval.

213. Existing Repairs. TC Holders will be required to develop processes that will enable operators to identify and obtain DTI for existing repairs on their airplanes that affect FCBS. Collectively, these processes are referred to as the Repair Evaluation Guidelines and are addressed in paragraph 216 of this AC. These processes should be included in the Compliance Document or in a separate document and will provide operators a means for addressing existing repairs installed on their airplanes.

214. Future Repairs. Whether or not a DTE is already required by the airplane certification level or other FAA-approved program, all new repairs installed on or after the effective date of §§ 26.43, 26.45, and 26.47, that affect FCBS must have a DTE performed. This includes blendouts, trim-outs, etc. that are beyond published TC Holder limits. For new repairs, the TC Holder may, in conjunction with an operator, use the three stage approval process provided in Appendix 5 of this AC. This process involves incremental approval of certain engineering data to allow an operator to return its airplane to service before all the DT Data are developed and approved. The TC Holder should include this process in the Compliance Document if it intends to apply it. The operator would then include this same process in its OIP as a means for addressing new repairs that adversely affect FCBS.

215. Expanded or New Repair Assessment Guidelines.

a. In order to expedite the process for an operator to obtain DTIs necessary to address the adverse affects repairs may have on FCBS, the TC Holder may determine that the existing Repair Assessment Guidelines (RAGs) document should be expanded to address other FCBS of the airplane pressure boundary. In addition, for airplanes that do not currently have a RAG, the TC Holder may determine that in order to fully support operators in obtaining DTIs, a new RAG document may need to be developed.

b. General guidance for developing this material can be found in AC 120-73, *Damage Tolerance Assessment of Repairs to Pressurized Fuselages*. The RAGs or any other

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streamlined process developed to enable operators to obtain DTIs without having to go directly to the TC Holder will support the TC Holder's development of the Regulatory Evaluation Guidelines (REGs) addressed in the following paragraph. As part of the REGs, the TC Holder will be required to develop a process that operators can use to determine how they may obtain DTI for a particular repair to support compliance with the AASFR. For certain airplane models a RAG will be a key component of that process.

216. Repair Evaluation Guidelines. The REGs provide instructions to the operator on how to survey airplanes, how to obtain DTIs, and an implementation schedule that provides timelines for these actions. To assist the operators in obtaining DTIs for various repairs, § 26.43(e) requires the TC Holder to develop REGs for operators' use and submit them to the FAA Oversight Office for approval by June 30, 2009. Effective REGs may require that certain DT Data be developed by the TC Holder and made available to operators. Updated SRMs and SBs, together with the existing, expanded, or new RAG documents, form the core of the information that will need to be made available to the operator to support this process. In developing the REGs the TC Holder will need to determine what DT Data are currently available for repairs and what new DT Data will need to be developed to support operator compliance. The REGs may be submitted as part of the Compliance Document under a section titled "Repair Evaluation Guidelines" or as a separate document referenced in that section. The REGs should include:

- a.** A process for conducting surveys of affected airplanes that will enable identification and documentation of all existing repairs that affect FCBS;
- b.** A process for obtaining DTIs for repairs affecting FCBS that are identified during an airplane survey; and
- c.** An implementation schedule that provides timelines for:
 - (1)** Conducting airplane surveys,
 - (2)** Obtaining DTIs, and
 - (3)** Incorporating DTIs into the operator's maintenance program.

Paragraphs 217 through 219 of this AC describe the elements listed above in paragraphs 216(a), 216(b), and 216(c).

217. Implementation Schedule. The implementation schedule described in this paragraph represents an acceptable timeline for conducting airplane surveys. Any deviation to the timeline should be justified and presented to the FAA Oversight Office for approval. To support the operator in developing an OIP for its particular fleet of airplanes, the TC Holder should include the information contained in this section in the Compliance Document. Appendix 6 of this AC defines a process that may be used to establish timelines for assessing repairs and developing required maintenance actions. This process includes the airplane repair survey, identifying and dispositioning repairs requiring immediate action, and developing damage tolerance inspections. The timing allowance for any given airplane depends on the age of the airplane on December 18,

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2009. An example of establishing the timeline for when an airplane survey should be conducted can be found in Appendix 8 of this AC.

a. The implementation schedule for airplane surveys takes into account the percentage of time in hours, cycles, or both, in relation to an airplane's design service goal (DSG). The TC Holder should identify the established DSG for a particular airplane type that is representative of the airplane, considering the probable variation of the number of flight hours per cycle that could exist in the fleet. The TC Holder should include in its compliance plan a description of the methodology used to establish the DSG. The following three processes can be used to schedule airplane surveys.

(1) Airplanes less than 75 percent of DSG on December 18, 2009. Operators complete a survey at the first heavy maintenance check (time limit equivalent to a "D-check") after an individual airplane reaches 75 percent of the DSG, not to exceed the DSG.

NOTE: A heavy maintenance check (D-check or equivalent airplane inspection) is an airplane maintenance visit where the major structural inspections are performed. In some cases, this may be a formal D-check or, in the case of a Maintenance Steering Group (MSG)-2 or -3 based maintenance program, the D-check equivalent may be the "C-check" multiple that contains the majority of the major structural inspections, such as a "C-4" which is sometimes called a heavy maintenance visit.

(2) Airplanes between 75 percent of the DSG and the DSG on December 18, 2009. Operators complete a survey of individual airplanes at or before the next heavy maintenance check (equivalent to a D-check) after December 20, 2010, not to exceed the DSG or 6 years, whichever occurs later.

(3) Airplanes Beyond the DSG on December 18, 2009. Operators complete a survey of individual airplanes at or before the next heavy maintenance check (equivalent to a D-check) after December 20, 2010, not to exceed 6 years.

NOTE: Operators should not defer the implementation of the program until the end of the D-check time period. For example, if an operator has 30 airplanes over DSG on December 18, 2009, and is operating on a 6-year D-check equivalent, the operator should inspect approximately 5 airplanes each year until all of the airplanes are inducted into the program. The highest time airplanes should be inspected first (for example, using the above example of 30 affected airplanes, the 10 highest time airplanes should be surveyed in the first two years).

b. Data Submissions for Repairs Identified During the Survey.

(1) The TC Holder is required to submit DT Data to the FAA Oversight Office for approval within certain time frames. These time frames take into consideration whether the data is for existing published repairs and existing non-published repairs. The operator has a specified time frame for obtaining and incorporating the DTI into its maintenance program based on the TC Holder's DTE.

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(a) For existing published repairs, the TC Holder must submit the data by June 30, 2009.

(b) For existing, non-published repairs and deviations to published repairs identified in the survey, if the REGs direct operators to contact the TC Holder to obtain DTIs, the TC Holder should submit the DT Data to the FAA Oversight Office within 12 months after identification.

(c) For repairs covered by TC Holder published repair data, operators should obtain and incorporate into their maintenance program DTIs for existing repairs within 6 months after accomplishing the airplane survey. For non-published, repairs found during the survey, incorporation should be completed no later than 6 months after FAA approval of the data (see Appendix 6 of this AC for the DTI assessment process).

(2) The DT Data for repairs identified in an airplane survey may be approved by a FAA Designee, as coordinated with and authorized by the FAA Oversight Office. The same timelines for data approval apply.

218. Developing a Process for Conducting Surveys of Affected Airplanes. The TC Holder should develop a process for use by operators to conduct airplane surveys. These airplane surveys are conducted by operators to identify and document repairs and repairs to alterations that may be installed on their airplanes. The survey is intended to help the operators determine which repairs may need a DTE in order to establish the need for DTIs. Identification of repairs that need DTIs should encompass only existing repairs that reinforce (for example, restore strength) the FCBS. This typically excludes maintenance actions such as blend-outs, plug rivets, trim-outs, etc. The process the TC Holder develops to conduct surveys should include:

a. A survey schedule based on the DSG (see paragraph 217(a) of this AC).

b. Areas and access provisions for the survey.

c. A procedure for repair data collection that includes:

(1) Repair dimensions,

(2) Repair material,

(3) Repair fastener type,

(4) Repair location,

(5) Repair proximity to other repairs,

(6) Repairs covered by published repair data, and

(7) Repairs requiring DTIs.

- d. A means to determine whether or not a repair affects FCBS.

219. Developing a Process to Obtain DT Data for Repairs.

a. The TC Holder must develop a process that operators can use to obtain DTIs that address the adverse effects repairs may have on FCBS. In developing this process, TC Holders will need to identify all applicable DTIs they have developed that are available to operators. This may include updated SRMs and SBs, existing RAGs, expanded or new RAGs, and other sources of DTIs developed by the TC Holder. For certain repairs, the process may instruct the operators to obtain direct support from the TC Holder. In this case, the TC Holder evaluates the operator's request and makes available DTI for a specific repair or group of repairs, as needed. These may include operator or third-party developed/approved repairs, and repairs that deviate from approved published repair data. This process will be the key element of the REGs described in paragraph 216 of this AC.

b. The process should state that existing repairs that already have DTIs developed and in place in the maintenance program require no further action. For existing repairs identified during an individual airplane survey that need DTIs established, the process may direct the operators to obtain the required DTIs from the following sources:

- (1) TC Holder published service information such as DT-based SRMs, SBs, or other documents containing applicable DT Data for repairs.
- (2) Existing FAA-approved RAG documents (developed for compliance with § 121.107).
- (3) Expanded or newly developed RAG documents.
- (4) Procedures developed to enable operators to establish DTIs without having to contact the TC Holder for direct support. These procedures may be similar in concept to the RAG documents.
- (5) Direct support from the TC Holder for certain repairs. The operator directly solicits DTIs from a TC Holder for certain individual repairs as those repairs are identified during the survey.

220. Repairs to Alterations. See Chapter 3 of this AC.

221. Repairs to Removable Structural Components. Fatigue critical structure (FCS) may include structure on removable structural parts or assemblies that can be exchanged from one airplane to another, such as door assemblies and flight control surfaces. In principle, the DT Data development and implementation process also applies to repairs to FCS on removable components. During their life history, however, these parts may not have had their flight times recorded on an individual component level because of removal and reinstallation on different airplanes multiple times. These actions may make it impossible to determine the component's

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age or total flight hours or total flight cycles. In these situations, guidance for developing and implementing DT Data for existing and new repairs is provided in Appendix 7 of this AC.

222. FAA Oversight Office Approval. The FAA Oversight Office responsible for the affected airplane's TC or STC will approve the TC or STC Holder submissions whether submitted as separate documents or consolidated in a Compliance Document. This approval process also includes any documents referenced from a Compliance Document. Any subsequent revisions to the submissions, either separate documents or a Compliance Document, or to DTIs for repairs must be submitted to the FAA Oversight Office for review and approval. The DT Data submitted by TC or STC Holders may be approved by a FAA Designee, as coordinated with and authorized by the FAA Oversight Office.

223. thru 299. [RESERVED].

CHAPTER 3. TC AND STC HOLDER TASKS FOR ALTERATIONS AND REPAIRS TO ALTERATIONS

300. General Information About This Chapter. This chapter provides guidance to TC and STC Holders for developing a list of fatigue critical alteration structure (FCAS) and DT Data for alterations that affect fatigue critical baseline structure (FCBS). This information will enable operators to comply with §§ 121.1109(c)(2) and 129.109(b)(2) with respect to alterations and repairs to alterations. The final product of this guidance is a document containing the FCAS list and DTIs. This document is called the TC or STC Holder Compliance Document, and upon approval by the FAA Oversight Office, will constitute compliance with § 26.45 or § 26.47. The guidance in this chapter applies to new and existing alterations installed on the baseline structure of the airplane. TC and STC Holders must (per §§ 26.45 and 26.47) make available to operators DTIs for their alterations that affect FCBS and for repairs they developed that affect any FCAS.

a. There are three categories of alterations that may be installed on a transport category airplane, all three categories may require the development of DT Data:

(1) STC Holder alterations – normally developed by persons other than the TC Holder. STCs are approved by the FAA Oversight Office under Subpart E of 14 CFR part 21.

(2) TC Holder alterations – are developed by the TC Holder, either through an amended type certificate approved by the FAA under Subpart I of 14 CFR part 21, or through FAA-approved service documents such as SBs.

(3) Individual alterations – alterations developed by and for an operator that are approved through an individual FAA Form 337, *Major Repair and Alteration*, or other means acceptable to the FAA Administrator.

b. The DT Data will be applicable to a specific alteration (see Appendix 9 of this AC) developed by the TC or STC Holder and should provide the data necessary for developing, in part, an operator's implementation plan (OIP). In developing the DT Data, the TC and STC Holders should coordinate closely with the affected operators.

c. For alterations that are not developed by a TC or STC Holder, the operator is responsible for determining whether the alteration falls into any of the categories listed in Appendix 9 of this AC. These alterations would typically be identified during the operator records review or in the airplane repair survey (see paragraph 218 of this AC). The operator is responsible for developing or obtaining DTI for these alterations. Chapter 4 of this AC addresses the operator tasks for developing an OIP and developing or obtaining DTIs.

301. Contents of Compliance Document. The Compliance Document developed by the TC or STC Holder will be used by operators to develop their OIP. The TC and STC Holders should use the guidance in this paragraph for developing and making available compliance documentation. If the TC or STC Holder already has FAA-approved DT Data for the required § 25.571 amendment level, the TC or STC Holder should include in its Compliance Documents the status of the alteration with respect to damage tolerance. In order for the OIP to fulfill the requirement for a means to address adverse effects of alterations, and of repairs on FCAS, the following should be included in the Compliance Document for each alteration that affects FCBS.

- a.** “Airplane Applicability” that contains specific airplane model, series, airplane serial number, and the certification amendment level of the alteration.
- b.** “Affected Alterations” that contains the following:
 - (1)** A list of alterations that affect FCBS, and
 - (2)** A list of alterations that have FCAS.
- c.** DTIs for:
 - (1)** Alterations developed by the TC or STC Holder that affect FCBS.
 - (2)** Repairs developed by the TC or STC Holder that affect FCAS.

NOTE: If the results of the DTE determine that supplemental inspections are not required, the DTI documentation should contain a statement to that effect.
- d.** A description of the process used to document and make available to operators new DTIs required for existing and future alterations and repairs to alterations.

Figure 2, below, shows the process for producing a Compliance Document for repairs that affect FCBS.

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TC/STC Holder Tasks for Alterations

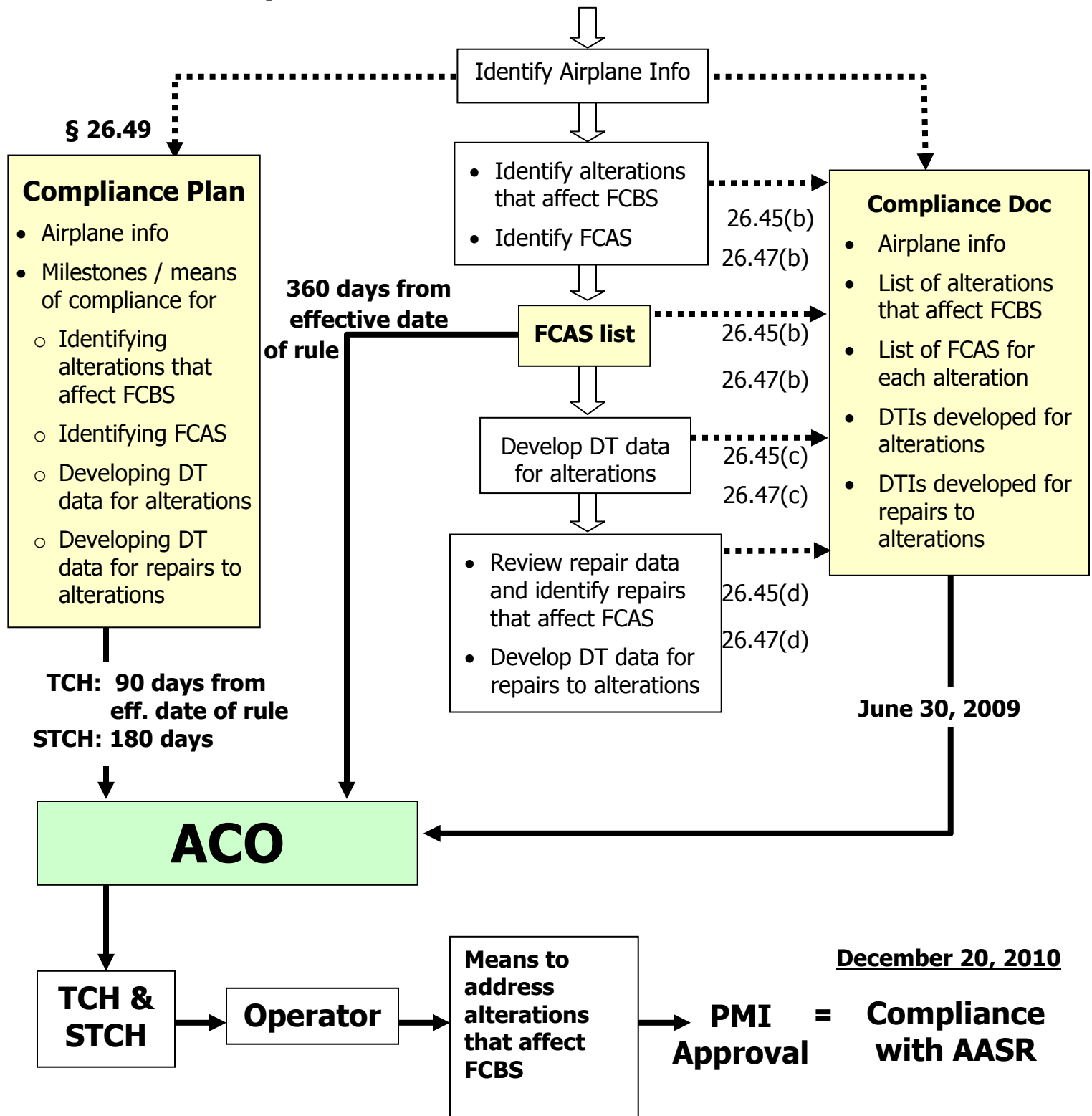


Figure 2 - TC and STC Holder Tasks for Alterations and Repairs to Alterations

302. Applicability. For each alteration affecting FCBS, the TC or STC Holder will develop model-specific data detailing the airplane make, model, model variations or serial numbers on which the alteration may be installed, and the certification amendment level of the alteration. These data will be presented to the FAA Oversight Office as required under §§ 26.45 and 26.47. The certification amendment level used for determining DT Data for a specific existing alteration should be the same certification level established for assessing repairs (see Chapter 2 of this AC). For certification of new alterations, the Changed Product Rule (§ 21.101) may require the current § 25.571 amendment level to be used.

303. Certification Amendment Level. In order to understand what data are required, the TC or STC Holder should identify the amendment level of the original certification relative to § 25.571. The amendment level is useful in identifying what DT Data may be available and what standard should be used for developing new DT Data. The two relevant airplane groups are:

- a. Group A** - Airplanes certified to CAR 4b or § 25.571, prior to Amendment 25-45. These airplanes were not evaluated for damage tolerance as part of the original type certification. Therefore, the requirements of the AASFR are beyond the scope of the original certification amendment level. Unless previously accomplished, alterations to FCBS will need DT Data developed.
- b. Group B** - Airplanes certified to § 25.571, Amendment 25-45 or later. These airplanes were evaluated for damage tolerance as part of the original type certification. Alterations to these airplanes will need to meet their certification level. Because some of the alterations for certain of these airplanes may not have alteration data that includes DT Data, the TC or STC Holder and operators may need to identify and perform a DTE of these alterations and develop DTIs.

304. Obtaining the List of FCBS. The STC Holder should obtain the list of FCBS directly from the TC Holder. Section 26.43 requires the TC Holder to make the list of FCBS available to STC Holders that are required to comply with § 26.47 and to operators required to comply with §§ 121.1109 and 129.109.

305. Identifying Alterations That Affect FCBS.

a. Sections 26.45(b)(1) and 26.47(b)(1) require TC and STC Holders to review their existing alteration data and identify all alterations that affect FCBS. For each alteration that affects FCBS, the TC or STC Holder must perform a DTE and develop DTIs that address any adverse effects the alteration may have on FCBS. The TC or STC Holder should develop a list of FCBS that the alteration affects. An alteration that meets any of the following conditions is considered an alteration that affects FCBS:

- (1)** The alteration is installed on or interfaces with FCBS.
- (2)** The alteration changes the fatigue load environment of FCBS.

(3) The alteration degrades the inspectability of the FCBS for existing inspection methods developed for the FCBS.

b. The TC and STC Holder can limit their review of alteration data to those alterations that fall into any of the categories listed in Appendix 9 of this AC. For the TC Holder, this would include data for its FAA-approved alterations and STCs it owns for alterations. For STC Holders, the alteration data would be limited to its STC alterations. This data must be reviewed to determine if the defined alteration, when installed, would affect FCBS, regardless of the size or complexity of the alteration. The review must also determine if the alteration data complies with § 25.571 and contains associated DTIs, if applicable.

306. Identifying FCAS. For those alterations that affect FCBS, the TC or STC Holder of the alteration must determine if the alteration contains FCS. Guidance for identifying this structure can be found in AC 25.571, *Damage Tolerance and Fatigue Evaluation of Structure*, using the revision level of the AC that is consistent with the certification level of the airplane (initial issuance of the AC or later revisions may be used when the airplane certification level is prior to Amendment 25-45). This structure is referred to as “fatigue critical alteration structure.” The intent of the AASFR is to address the same structure that is required to have DT Data for compliance with § 25.571. Section 25.571(a) states “An evaluation of the strength, detail design, and fabrication must show that catastrophic failure due to fatigue...will be avoided throughout the operational life of the airplane. This evaluation must be conductedfor each part of the structure which could contribute to a catastrophic failure (such as wing, empennage, control surfaces, fuselage, engine mounts, and their related primary attachments)....” The DTE performed to determine if an alteration has FCS would address the fatigue life and inspectability of any fatigue critical structure that may be added to an airplane by an alteration. For any alteration that affects FCBS, the TC or STC Holder is required to produce a list of any FCAS (§§ 26.45(b)(4) and 26.47(b)(4)).

307. List of Alterations. After identifying alterations that affect FCBS and identifying alterations that contain FCS, TC or STC Holders should produce a list of these alterations. The list of alterations affecting FCBS and list of alterations containing FCS should be submitted by the TC or STC Holder to the FAA Oversight Office for approval. This list must be made available to operators to support operators in determining if they have alterations installed on their airplanes that may adversely affect FCBS (§§ 26.45(b)(4) and 26.47(b)(4)). While the list will be submitted to the FAA before the Compliance Document submittal, the list, or a reference to the list, should also be included in the Compliance Document.

308. Description of Alteration. TC and STC Holders should describe in their Compliance Document each alteration that affects FCBS or contains FCS. The description should detail the location of the alteration on the airplane, major design aspects of the alteration, applicability, and certification level. Also, a reference to where DTIs are located if it is determined that DT Data exist for a particular alteration. This information may be incorporated by reference in the Compliance Document.

309. Certification Standard Applied in Performing a DTE. When developing DT Data, the certification level of the affected airplane determines the damage tolerance requirements. For Group A airplanes, as identified above, the TC or STC Holder should use the requirements of § 25.571, at Amendment 25-45, as a minimum standard. For Group B airplanes, the TC or STC

Holder should use the requirements that correspond to the original certification level as a minimum standard.

310. Performing a DTE on Alterations That Affect FCBS.

- a.** A DTE should be performed for each alteration that affects FCBS. The DTE would apply to the affected FCBS and alteration that may have FCS, and may consist of an individual analysis or the application of a DT-based process such as RAGs that would be used by an operator. The result of the DTE should lead to the development of DTIs that address any adverse effects the alteration may have on the FCBS. If the results of the DTE indicate that DTIs are not required to ensure the continued airworthiness of the affected FCBS, the TC or STC Holder should provide a means for documenting the results of the DTE. This will inform an operator that a DTE was performed for the affected FCBS. If it is found that an alteration does not affect FCBS, no further action is required.
- b.** The term “the adverse effects” refers to a degradation in the fatigue life or inspectability of FCS that may result from an alteration or repair to an alteration. Degradation in fatigue life may result from an increase in loading, while degradation of inspectability may result from physical changes made to the structure. The evaluation would be performed within a time frame that ensures the continued airworthiness of affected or added FCS. In addition, any repairs to alterations that affect FCAS must also have a DTE performed. This would apply to those repairs developed by the TC or STC Holder for its alteration.

311. Reviewing Existing DT Data for Alterations That Affect FCBS. The review of alteration data to identify those alterations that may have an adverse effect on FCBS should include a determination if this data contains DT Data, such as DTIs for alterations and repairs to alterations. For each such alteration or repair to an alteration, unless previously accomplished, the TC or STC Holder must perform a DTE and develop any necessary DTIs for the affected FCBS and FCAS. This DT Data will provide operators a means for addressing these alterations for compliance with the AASFR. For some alterations, the DTE will conclude that no new DTIs will be required for the affected FCBS or any FCS of the alteration. In such a case, the TC or STC Holder should include a statement to that effect in the Compliance Document and the DT Data made available to the operator. Typical documents needing review would include, but are not limited to the following:

- a.** TC or STC Holder-developed SBs that provide:
 - (1)** Instructions for alterations that may affect FCBS, or
 - (2)** Inspections for repairs to alterations.
- b.** ADs that mandate:
 - (1)** Alterations or repairs to alterations.
 - (2)** Inspections of alterations.

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- c. RAG documents.
- d. Individual alterations.

312. Developing DT Data for Alterations. The existing published alteration documentation may not provide the necessary DTIs. In this case, additional DT Data may need to be developed. This data may range from a DTE on a case-by-case basis to a revision of existing documents to incorporate the needed DTIs. The needed data may be published in various forms depending on the type of alteration. Based on the DTE performed for alterations that affect FCBS (see paragraph 310 of this AC) and on the review of existing DT Data (see paragraph 311 of this AC), a determination should be made as to any additional data required. The additional data would be developed in accordance with the revision level of AC 25.571 that corresponds to the certification level of the airplane to meet the requirements of §§ 26.45 and 26.47. Depending on the alteration, additional data may be published in various forms.

- a. **STC alterations** – The additional DT Data for existing alterations may be published in the form of an amended STC, or an individual approval.
- b. **TC Holder alterations** – The additional DT Data for existing alterations may be published in the form of an amended TC, TC Holder service information, etc.
- c. **Alterations not developed by a TC or STC Holder** – For alterations identified in Appendix 9 of this AC that affect FCBS and were not developed by a TC or STC Holder, the operator is responsible for obtaining DT Data for those alterations. These types of alterations include, but are not limited to, alterations approved through FAA Form 337, *Major Repair and Alteration* (a field approval). See Chapter 4 of this AC for guidance operators can use to establish acceptable timelines for developing DT Data and for incorporating the DTI into their maintenance program.

313. Timelines for Developing DT Data for Alterations. This paragraph provides the required timelines for developing DT Data for both existing and new alterations that affect FCBS. These timelines reflect the compliance dates specified in §§ 26.45 and 26.47.

- a. For existing alteration data developed and approved before the effective date of §§ 26.45 and 26.47, the TC or STC Holder must make available to the operator DTI for its alteration by December 18, 2009. Operators will have until December 20, 2010, to incorporate a means to address alterations into their maintenance programs for compliance with §§ 121.1109 and 129.109.
- b. For alteration data developed after the effective date of the rule, the TC or STC Holder must perform a DTE and develop DTIs (if required) for the affected FCBS and any FCAS before the alteration is approved. The DT Data must be submitted to the FAA Oversight Office to support FAA approval of the alteration data.

314. Developing DT Data for Repairs Affecting FCAS. In determining what DT Data will need to be developed for repairs to alterations TC and STC Holders should review repair data developed by the TC or STC Holder and identify each repair that affects any FCAS. For each repair identified that affects FCS of an alteration, unless previously accomplished, perform

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a DTE and develop DT Data according to the minimum standard determined in paragraph 205 of this AC. The DTE should address the effects that the repair may have on any FCBS that is affected by the alteration. Repair data may include, but is not limited to, the following:

- a. SRM repairs.
- b. SB repairs.
- c. AD mandated repairs.
- d. TC and STC Holder reviewed and approved repairs that have general interest (multiple airplane approvals).

315. Timelines for Developing DT Data for Repairs Affecting FCAS. The timelines in this paragraph provide the required timelines for developing DT Data for both existing and new repairs made to alterations that affect FCBS. These timelines reflect the compliance dates specified in §§ 26.45 and 26.47.

- a. For repair data developed and approved before the effective date of §§ 26.45 and 26.47, the TC and STC Holder must submit required DT Data to the FAA Oversight Office by June 30, 2009.
- b. For repair data developed and approved after the effective date of the §§ 26.45 and 26.47, the TC and STC Holder should submit required DT Data to the FAA Oversight Office within 12 months after initial approval of the repair data and before making the DTIs available to persons required to comply with §§ 121.1109 and 129.109.
- c. For repairs not developed by the TC or STC Holder that affect FCAS of the TC or STC Holder's alteration, the operator is responsible for obtaining the DTIs required for the repair and affected FCAS. The operator is encouraged to coordinate development of the necessary DT Data with the TC or STC Holder of the affected alteration.

316. FAA Oversight Office Approval.

- a. If the FAA Oversight Office finds the required data submitted by the TC or STC Holder acceptable, it will approve the data. This data may be submitted as individual documents, in a Compliance Document, or both. The FAA Oversight Office will also approve any documents or data referenced in a Compliance Document. Any subsequent revisions to the data must be submitted to the FAA Oversight Office for review and approval. FAA approval is also required for revisions to documents or data referenced in the Compliance Document, or to DTIs for alterations or repairs to alterations.
- b. If a TC or STC Holder responsible for developing an alteration that affects FCBS is no longer in business, or has surrendered its TC or STC, the operator is responsible for submitting DT Data to the FAA Oversight Office for approval. This includes timelines for when the operator will develop DT Data and incorporate it into the operator's maintenance program.

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CHAPTER 4. OPERATOR TASKS FOR REPAIRS AND ALTERATIONS

400. General Information About This Chapter. This chapter provides guidance to operators for developing a means for addressing the adverse effects repairs and alterations may have on fatigue critical structure (FCS). The final product of this guidance is the development of an Operator Implementation Plan (OIP) which, upon approval by the operator's Principal Maintenance Inspector (PMI) and incorporation into its maintenance program, constitutes compliance with §§ 121.1109(c)(2) and 129.109(b)(2). The OIP will contain the processes and timelines the operator will use for obtaining and incorporating into its continuous airworthiness maintenance program (CAMP) DTIs that address the adverse effects of repairs and alterations.

401. Developing an Operator Implementation Plan. Using the guidance in this chapter, operators can develop an OIP by incorporating processes, data, and schedules developed by TC and STC Holders, and by themselves. The OIP should contain information describing how the operator will identify repairs and alterations affecting FCS, how the operator will obtain and incorporate DTIs for those repairs and alterations, and the timelines of these actions. Operators will first need to determine how they will obtain the information necessary to develop the OIP by considering the following conditions:

- a. The TC or STC Holder exists and will make the DTIs available to the operator;
- b. The DTIs already exist and are available;
- c. The DTIs are not available from TC or STC Holders;
- d. DTIs are not available for alterations developed by persons other than TC or STC Holders.

NOTE: For paragraphs 401c and 401d, above, the operator is responsible for developing or obtaining the DT Data. If the operator is unable to obtain the data it will need to coordinate the development of necessary DT Data through a third party.

402. Contents of an OIP. The OIP should include processes and procedures to ensure that all new and existing repairs and alterations affecting FCBS are evaluated for damage tolerance and have implemented DTIs. Operators should use information contained in TC and STC Holder Compliance Documents (see Chapters 2 and 3 of this AC), which provide processes, timelines, lists of FCS, and airplane design service goals or other necessary data. For alterations developed by the operator or third parties, and those developed by TC or STC Holders that are no longer in business, the operator will need to use the guidance in this AC to develop the processes and timelines for obtaining and incorporating into its CAMP the DTIs for those alterations. The contents of the OIP should include:

- a. A process that implements the elements of the Repair Evaluation Guidelines (REGs) obtained from the TC Holder's Compliance Document that will assist the operator in obtaining, developing, and implementing DTIs on its airplanes. The REGs include:

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- (1) A process for conducting surveys to identify and determine if existing repairs and alterations affect FCBS,
- (2) A process for obtaining DTIs, and
- (3) An implementation schedule for repairs establishing timelines for accomplishing the survey and for incorporating DTIs into the CAMP.

b. A process to determine if DTIs exist for those repairs and alterations identified in the airplane survey.

NOTE: This includes alterations not developed by TC or STC Holders and those that have not been identified through operator records review.

c. A process to obtain DTIs for repairs. See Appendices 5 and 6 of this AC for an acceptable approach.

d. A process for producing a list of alterations that affect FCBS on an operator's airplane(s).

e. A process to review documents (such as instructions for continued airworthiness) relating to alterations developed by persons other than a TC or STC Holder to ensure DTIs are provided or developed for those alterations.

f. A process for obtaining DTIs for new alterations.

g. A process for obtaining DTIs for alterations not supported by a TC or STC Holder.

h. A process describing how DTIs for repairs and alterations will be incorporated into the part 121 or part 129 operator's maintenance program, and for showing where the DTIs exist within the operator's maintenance program.

i. A means of ensuring that the airplane will not be operated past the time limit established for obtaining DTIs.

403. Repairs. Repairs affecting FCBS need to be evaluated to determine if DT-based inspections are needed to ensure continued airworthiness. If a repair survey is utilized, use the survey parameters from Chapter 2 of this AC to identify repairs that may need DT Data developed. The survey plan may be divided into three groups of airplanes, as described in paragraph 404 of this AC. The DTIs will be implemented in accordance with paragraph 406 of this AC. Unless already required by the airplane certification level or other FAA-approved program, beginning December 21, 2010, and thereafter, all new repairs affecting FCBS must have a DTE performed. Implement any DTIs established from the DTE according to the process described in Appendix 5 of this AC. This includes blendouts, trim-outs, etc. that are beyond published TC Holder limits. For repairs installed on structure that has been altered, the operator is responsible for coordinating development of the required DT Data with the party responsible for the design of the alteration.

404. Schedule for Implementing DTI for Existing Repairs.

a. To implement DTIs for existing repairs, an operator should use the assessment process in Appendix 6 of this AC. For existing repairs that require DTIs, an implementation schedule should be established providing timelines for airplane repair surveys, identifying and dispositioning repairs requiring immediate action, and developing DTIs (see Appendix 6 of this AC for additional information). The survey should enable operators to identify existing repairs that affect FCBS and would apply to all affected airplanes in an operator's fleet, as defined in the OIP. The different elements included in the airplane survey are contained in paragraph 216 of this AC. Existing repairs that already have DTI in the CAMP require no further action.

b. The timelines established for any given airplane depends on the age of the airplane on December 18, 2009. To support development of the implementation schedule, the TC Holder will identify the design service goal (DSG) for each of its affected airplane models. The DSG will be used to establish the following timelines for conducting airplane surveys:

(1) Airplanes less than 75 percent of the DSG on December 18, 2009.

Operators should complete a survey of an individual airplane at the first heavy maintenance check (time limit equivalent to a "D-check") after the airplane reaches 75 percent of its DSG, not to exceed its DSG. Within 6 months after FAA approval, the required DTIs must be incorporated into the operators CAMP.

(2) Airplanes between 75 percent of the DSG and the DSG on December 18, 2009. Operators should complete a survey of these airplanes at or before each individual airplane's next heavy maintenance check (equivalent to a D-check) after December 20, 2010, not to exceed the DSG or 6 years, whichever occurs later. Within 6 months after FAA approval, the required DTIs must be incorporated into the operator's CAMP.

(3) Airplanes beyond the DSG on December 18, 2009. Operators should complete a survey of these airplanes at or before each individual airplane's next heavy maintenance check (equivalent to a D-check) after December 20, 2010, not to exceed 6 years. The highest time airplanes should be inspected first. Within 6 months after FAA approval, the required DTIs must be incorporated into the operator's CAMP.

405. Implementing DTI For Repairs.

a. To implement DTIs for repairs, the operator should review inspection methods and intervals from an FAA-approved DTE. The operator may choose to implement DTIs as part of the regularly scheduled maintenance program, on an individual basis (by conducting inspections at established thresholds and repetitive intervals), or a combination of both.

b. Once the DTIs are known, accomplish the first inspection of the repair according to the following schedule:

(1) Inspect the repair before the inspection threshold or within a time limit equivalent to a "C-check" from accomplishment of the survey, whichever occurs later.

(2) If the age of the repair is unknown, use the airplane's age in flight cycles or flight hours.

(3) Implement repetitive inspection intervals per the instructions provided.

c. DTIs must be developed for any repair installed after December 20, 2010, that affects FCBS. As determined necessary by the DTE, the DTIs would apply to the repair and the FCBS that are affected by the repair for compliance with the Aging Airplane Safety Final Rule (§§ 121.1109 and 129.109). DTI thresholds and repetitive intervals for individual repairs cannot be exceeded without approval of the FAA Oversight Office or an FAA Designee.

406. Alterations.

a. The operator should identify the alterations that exist in its fleet of airplanes. The operator should consider the list of alterations contained in Appendix 9 of this AC in determining which alterations may affect FCBS. If an operator's records are complete, this may be done by review of airplane configuration records. Otherwise, the airplane survey may be used to identify all alterations. The operator should then establish which alterations have been installed on or likely affect FCBS and prepare a list of alterations by airplane. The FAA-approved Compliance Documents from the TC Holder may be used to identify the FCBS. An operator can develop the list of alterations by using the following steps:

(1) Compile a list of all alterations that are currently installed on its fleet.

(2) Include in the list those alterations that affect FCS, but have since been removed (components removed) but the altered structure remains.

(3) Delete from the list those alterations that are not installed on its current fleet.

(4) Delete from the list those alterations that do not affect FCS. The remaining alterations that affect FCS on this list will require DT Data.

(5) Review each alteration to determine whether:

(a) The DT Data already exist; or

(b) The DT Data need to be developed.

(6) Submit a letter to the FAA Oversight Office, through the operator's PMI, providing a list of alterations developed by an STC Holder on the operator's active fleet.

b. Some individual alterations may not be identified through a review of airplane maintenance records. In these situations, the means of compliance is a plan to survey the airplane for alterations similar to the repair survey in Chapter 2 of this AC. The DTIs developed for those alterations identified in the survey should be implemented into an operator's maintenance program according to the schedule identified in paragraph 408 of

this AC. It is anticipated that most airplanes will need to be surveyed in order to ensure all alterations are identified. This survey can be conducted at the same time the survey for repairs is performed. The operator should begin developing the list of alterations as soon as the TC Holders make their list of FCBS available.

407. Schedule for Developing and Incorporating DTIs for Alterations.

a. Operators should develop a schedule for obtaining and incorporating DTI for alterations installed on their airplanes. For existing and new alterations developed by a TC or STC Holder, the timelines for incorporating the DTI into an operator's CAMP are provided in paragraph 313 of this AC and should be contained in the TC and STC Holder's Compliance Document.

b. For alterations where DTIs are not made available by TC or STC Holders, or for alterations developed by persons other than a TC or STC Holder, the operator is responsible for obtaining or developing the DT Data and for establishing a schedule using the timelines provided in this paragraph. The schedule would include timelines for submitting the DT Data to the FAA Oversight Office for approval, and for incorporating the DTIs into the operator's maintenance program. The operator may develop the DT Data using the guidance in paragraph 312 of this AC or the operator may contract the work out to a third party who may also use the same guidance. The operator must submit operator-developed DT Data and timelines to the FAA Oversight Office for approval. DT Data developed by a third party may be submitted to the FAA Oversight Office for approval by the operator or by the third party. The following are acceptable timelines for submitting DT Data to the FAA Oversight Office and for incorporating the approved DTIs into the operator's maintenance program:

(1) For alterations identified through the records review (see paragraph 407 of this AC), the operator or third party-developed DT Data should be submitted to the FAA Oversight Office no later than December 20, 2012, or prior to the airplane reaching 75 percent of the design service goal, whichever occurs later. The operator should incorporate the DTI into its CAMP no later than 6 months from the date the FAA approves the data.

(2) For alterations that are found during the airplane survey for repairs, the operator or third party-developed DT Data should be submitted to the FAA Oversight Office no later than 12 months from the time of discovery. The operator should incorporate the DTIs into its maintenance program no later than 6 months from the date the FAA approves the data.

(3) Once the DT Data is developed for an alteration on one airplane, the data may be used for other airplanes in the operator's fleet with the same alteration.

408. Implementing DTIs for Alterations. Operators should accomplish the first inspection of an alteration according to the DTI schedule. If the age of the alteration is unknown, use the airplane age in total flight cycles or total flight hours, as applicable.

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- a.** For airplanes which have not reached the inspection threshold for a DTI, accomplish the first inspection of the alteration before the inspection threshold or within a time limit equivalent to a C-check interval from incorporation of the DTI into the operator's approved maintenance program, whichever occurs later.
- b.** For airplanes which are beyond the inspection threshold for a DTI, accomplish the first inspection within a time limit equivalent to a C-check interval from accomplishment of the DTE for the alteration.
- c.** Implement repetitive inspection intervals per the DTI.
- d.** Any alteration installed after December 20, 2010, that affects FCBS must have DT Data that address the affected FCBS or FCS of the alteration for compliance with the Aging Airplane Safety Final Rule (§§ 121.1109 and 129.109).

409. Existing Responsibilities.

- a. Reporting Requirements.** Existing reporting requirements under § 121.703 still apply, however, the FAA encourages operators to report significant findings to the TC Holders to ensure that prompt fleet action is taken.
- b. Recordkeeping Requirements.** Existing record-keeping requirements still apply. Section 121.380 requires operators to retain records of the current inspection status of the airplane, including the times since the last inspections required by the inspection program. In addition, § 121.707 requires operators to prepare a report of major repairs and alterations which include repairs or alterations to FCBS.
- c. Transfer of Airplanes after December 20, 2010.** After December 20, 2010, before adding an airplane to its operations specifications or fleet, the operator should perform the following actions:
 - (1)** For an airplane previously operated under a part 121 or part 129 maintenance program, the new operator may use either the previously PMI-approved OIP for that airplane or its own PMI-approved implementation plan for repairs and alterations, if that plan applies to the airplane being acquired. Operators may also develop a new OIP for the new airplane.
 - (2)** For airplanes not previously operated under a part 121 or part 129 maintenance program, the operator develops and implements an OIP.
- d. Operation of Leased Foreign-Owned Airplanes.** Acquisition of a leased foreign-registered airplane for use in operations under part 121 requires the operator to develop and implement an OIP. The OIP should be developed in a manner that ensures that all repairs and alterations that affect FCBS are assessed, and any required DTIs for those repairs or alterations are incorporated into the maintenance program using the guidance in this AC.

410. FAA Principal Maintenance Inspector Approval of OIP. The operator's PMI is responsible for approving the means for incorporating the DTI for repairs and alterations into a

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part 121 or part 129 operator's maintenance program. The PMI will compare the operator's OIP with any Compliance Documents approved for a TC or STC Holder that are applicable to an operator's airplane. The PMI will then approve incorporation of the OIP into the operator's maintenance program by a revision to the operations specification. The operation specification will include the OIP by name, document number, and date.

411. Maintenance Program Changes. When revising a maintenance program containing DTIs for repairs and alterations affecting FCBS, the operator should evaluate any impact of the change on the DTIs. This evaluation should be made in accordance with the operator's Continuing Analysis and Surveillance Program and FAA-approved REGs. If the evaluation shows that a DTI needs to be revised, any revision to a DTI must be submitted through the PMI to the FAA Oversight Office for approval. Revisions made to the maintenance program to incorporate new or revised DTIs for FCS, or repairs or alterations to FCBS, or adding new FCS, must be approved by the operator's PMI and the operations specifications revised to show the revision.

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CHAPTER 5. ADMINISTRATIVE REQUIREMENTS

500. AC Availability – How Do I Get a Copy of the Publications Referred to in this AC?

- a.** The CFR and those ACs for which a fee is charged may be obtained from the Superintendent of Documents at the following address. A listing of the CFR and current prices is located in AC 00–44, “Status of Federal Aviation Regulations,” and a listing of all ACs is found in AC 00–2, “Advisory Circular Checklist.”

Superintendent of Documents
P.O. Box 371954
Pittsburgh, PA 15250–7954

- b.** To be placed on our mailing list for free ACs contact:

U.S. Department of Transportation
Subsequent Distribution Office
M-30
Ardmore East Business Center
3341Q 75th Avenue
Landover, MD 20785

- c.** You may view and print the CFR and Aircraft Certification Service and Flight Standards Service ACs on the FAA Web page at <http://rgl.faa.gov>.

501. Who Do I Submit Comments to About this AC?

Submit direct comments regarding this AC to:

U.S. Department of Transportation
Federal Aviation Administration
Aircraft Maintenance Division, AFS-300
800 Independence Avenue SW.
Washington, DC 20591

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APPENDIX 1.

REGULATORY AND GUIDANCE MATERIAL RELATED TO THIS AC

The following related documents are provided for information purposes and are not necessarily directly referenced in this AC. An electronic copy of the current revision levels of the following rules, ACs, and FAA Policy Statements that are noted by an (*) can be downloaded from the Internet at <http://rgl.faa.gov>.

1. Title 14 of the Code of Federal Regulations (14 CFR):

- a. Part 21, §21.101, Designation of applicable regulations.*
- b. Part 25, § 25.571, Damage-tolerance and fatigue evaluation. *
- c. Part 25, § 25.1529, Instructions for continued airworthiness.*
- d. Part 26, Holders of type certificates —Repairs*
- e. FAA Final Rule – “Fuel Tank Safety Compliance Extension and Aging Airplane Program” (69 FR 45936, July 30, 2004).*
- f. Part 43, § 43.13, Performance rules (general). *
- g. Part 43, §43.16, Airworthiness Limitations.*
- h. Part 91, § 91.403, General. *
- i. Part 121, § 121.1105, Aging airplane inspections and records reviews.*
- j. Part 121, § 121.1107, Special maintenance program requirements.*
- k. Part 121, § 121.1109, Supplemental inspections. *
- l. Part 129, § 129.109, Supplemental inspections for U.S.-registered aircraft.
- m. Part 129, § 129.107, Special maintenance program requirements.
- n. Part 129, § 129.105, Aging airplane inspections and records reviews for U.S.-registered multiengine aircraft.*

2. Advisory Circulars (AC):

- a. AC 21.101-1, Change Product Rule*
- b. AC 25.571-1C, Damage Tolerance and Fatigue Evaluation of Structure*
- c. AC 25.1529-1, Instructions for Continued Airworthiness of Structural Repairs on Transport Airplanes*
- d. AC 26-1, Part 26, Continued Airworthiness and Safety Improvements*
- e. AC 91-56A, Continuing Structural Integrity Program for Large Transport Category Airplanes *
- f. AC 120-73, Damage Tolerance Assessment of Repairs to Pressurized Fuselages*

3. FAA Policy Statement: PS-ANM110-7-12-2005, Policy Statement, Safety – A Shared responsibility – New Direction for Addressing Airworthiness Issues for Transport Airplanes,” issued July 6, 2005, effective July 12, 2005.*

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Appendix 1**4. FAA Orders:**

- a. Order 8900.1, Change 0, Flight Standards Information Management System, Volume 4 Aircraft Equipment and Operational Authorizations, Chapter 9, Selected Field Approvals, dated September 13, 2007.
- b. Order 8110.104, Responsibilities and Requirements for Implementing Part 26 Safety Initiatives

5. Other Documents referred to in this AC:

- a. A Final Report of the AAWG – Continued Airworthiness of Structural Repairs**
- b. A Report of the AAWG – Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Airplane Fleet**
- c. A Report of the AAWG - Recommendations For Regulatory Action To Enhance Continued Airworthiness Of Supplemental Type Certificates
- d. Air Transport Association (ATA) Report 51-93-01***
- e. ATA Response to FAA Docket 1999-5401, dated May 5, 2003***
- f. FAA-Approved, Model Specific, Repair Assessment Guidelines ****
- g. FAA-Approved, Model Specific, Supplemental Inspection Documents****

** An electronic copy of the AAWG reports can be downloaded from the Internet at <http://www.faa.gov>.

*** Please contact the ATA. Air Transport Association of America, Inc., 1301 Pennsylvania Avenue., NW, Suite 1100, Washington, DC 20004-1707; telephone (202) 626-4000.

**** Various manufacturers publish these documents. Please contact the applicable manufacturer regarding the general availability of the documents. The addresses are provided below.

- Airbus, 1 Rond-Point Maurice Bellonte, 31700 Blagnac Cedex, France
- The Boeing Company, P.O. Box 3707, Seattle, Washington 98124-2207
- Bombardier Aerospace, Bombardier Inc., 400 Cote Vertu West, Dorval, Quebec, H4S 1Y9
- British Aerospace, British Aerospace Regional Aircraft American Support, 13850 Mclearen Road, Herndon, Virginia 20171
- Fokker Services B.V., P.O. Box 231, 2150 AE Nieuw-Vennep, the Netherlands

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- Lockheed Martin Corporation/Lockheed Martin Aeronautics Company,
Airworthiness Office, Dept. 6A0M, Zone 0252, Column P-58, 86 S. Cobb Drive, Marietta,
Georgia 30063

APPENDIX 2. DEFINITIONS

- a. Airplane Structural Configuration** is the approved type certificate design, including the original; any model variations or derivatives; and alterations or replacements mandated by AD.
- b. Airworthiness Limitations Section (ALS)** is a collection of mandatory maintenance actions required for airplane structure and fuel tank system. For structural maintenance actions, the ALS includes structural replacement times, structural inspection intervals, and related structural inspection procedures.
- c. Alteration or Modification** is a design change that is made to an airplane. Within the context of this AC, the two terms are synonymous.
- d. Amended Type Certificate (ATC)** is an approval of a change to the type design proposed by the Type Certificate Holder.
- e. Baseline Structure** means structure that is designed under the original type certificate or amended type certificate for that airplane model.
- f. Damage Tolerance Data** are damage tolerance evaluation (DTE) documentation and the damage tolerance inspections (DTIs).
- g. Damage Tolerance Evaluation (DTE)** is a process that leads to a determination of maintenance actions necessary to detect or preclude fatigue cracking that could contribute to a catastrophic failure. As applied to repairs and alterations, a DTE includes the evaluation of the repair or alteration and the fatigue critical structure affected by the repair or alteration. The process utilizes the damage tolerance procedures as described in AC 25.571-1, 1A, 1B, or 1C.
- h. DTE Documentation** are data that identify the evaluated FCS, the basic assumptions applied in a DTE, and the results of a DTE.
- i. Damage Tolerance Inspections (DTIs)** are the inspections developed as a result of a DTE. A DTI includes the areas to be inspected, the inspection method, the inspection procedures, including acceptance and rejection criteria, the threshold, and any repetitive intervals associated with those inspections. The DTIs may specify a time limit when a repair or alteration needs to be replaced or modified. If the DTE concludes that DT-based supplemental structural inspections are not necessary, the DTI documentation should include a statement that the normal zonal inspection program is sufficient.
- j. Design Service Goal (DSG)** is the period of time (in flight cycles, flight hours, or both) established by the TC Holder at design and/or certification during which the fatigue critical structure will be reasonably free from significant cracking.
- k. Fatigue Critical Baseline Structure (FCBS)** is the baseline structure of the airplane that is classified as fatigue critical structure.

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l. Fatigue Critical Structure (FCS) is structure that is susceptible to fatigue cracking that could lead to a catastrophic failure of an airplane. For the purposes of this AC, FCS refers to the same class of structure that would need to be assessed for compliance with § 25.571(a) at Amendment 25-45, or later. The term FCS may refer to fatigue critical baseline structure, fatigue critical alteration structure, or both.

m. Federal Aviation Administration Oversight Office is the Aircraft Certification Office or office of the Transport Airplane Directorate having oversight responsibility for the relevant type certificate or supplemental type certificate, as determined by the Administrator.

n. Implementation Schedule consists of documentation that establish the timelines for accomplishing the necessary actions for identifying, developing, and obtaining DTI for repairs and alterations, and for incorporating those DTI into an operator's continuous airworthiness maintenance program (CAMP). The documentation would include the timeline for when airplane surveys would need to be accomplished.

o. Instructions for Continued Airworthiness (ICA) are the information developed in accordance with applicable airworthiness requirements that include the applicable methods, inspections, processes, procedures, and airworthiness limitations to keep the product airworthy throughout its operational life.

p. Published Repair Data are applicable instructions for accomplishing repairs that are published for general application in structural repair manuals and service bulletins (or equivalent types of documents).

q. Repair is the restoration of an item to a serviceable condition.

r. Repair Assessment Program (RAP) is a program to incorporate damage tolerance-based inspections for repairs to the fuselage pressure boundary structure (fuselage skin, door skin, and bulkhead webs) into the operator's maintenance and/or inspection program as required by § 121.1107 (previously designated as § 121.370).

s. Repair Evaluation Guidelines (REGs) provide a process to establish DTI for repairs that affect Fatigue Critical Structure.

t. Structures Task Group (STG) is a model-specific group that consists of TC Holders and operators responsible for the development of aging airplane model-specific programs. It also includes regulatory authorities who approve and monitor those programs. While STGs typically have not included STC Holders, STGs may be established by STC Holders to support the STC Holders' compliance with § 26.47.

u. Supplemental Structural Inspection Program (SSIP) is a damage-tolerance-based inspection program. Structural Inspection Programs only address the structure identified by the Type Certificate Holder using the guidance contained in AC 91-56.

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v. Type Design consists of drawings and specifications; information on dimensions, materials, and processes; airworthiness limitations; and any other data necessary to describe the design of the product (see 14 CFR 21.31).

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Appendix 3**APPENDIX 3. ACRONYMS USED IN THIS AC**

AASA	Aging Airplane Safety Act
AASFR	Aging Airplane Safety Final Rule
AASIFR	Aging Airplane Safety Interim Final Rule
AAWG	Airworthiness Assurance Working Group
AC	Advisory Circular
ACO	Aircraft Certification Office
AD	Airworthiness Directive
ALI	Airworthiness Limitation Items
ALS	Airworthiness Limitations Section
ARAC	Aviation Rulemaking Advisory Committee
DSG	Design Service Goal
DT Data	Damage Tolerance Data
DTE	Damage Tolerance Evaluation
DTIs	Damage Tolerance Inspections
FAA	Federal Aviation Administration
FCBS	Fatigue Critical Baseline Structure
FCS	Fatigue Critical Structure
OIP	Operator's Implementation Plan
PMI	Principal Maintenance Inspector
PSE	Principal Structural Element
RAG	Repair Assessment Guideline
RAP	Repair Assessment Program
REGs	Repair Evaluation Guidelines
SB	Service Bulletins
SRM	Structural Repair Manual
SSID	Supplemental Structural Inspection Document
SSIP	Supplemental Structural Inspection Program
STC	Supplemental Type Certificate
STG	Structures Task Group
TC	Type Certificate

APPENDIX 4. BACKGROUND

a. Structural fatigue is recognized as a significant threat to the continued airworthiness of airplanes. This is because even small fatigue cracks can significantly reduce the strength of airplane structure. Consistent with this, the airworthiness standards for certification of new transport category airplanes for over 50 years have addressed fatigue with the intent of preventing catastrophic failures due to fatigue throughout the anticipated operational life of the airplane. However, these standards have not remained unchanged. They have evolved as the relevant knowledge base has increased. This knowledge includes service experience, specific incidents and accidents, and technological advances in designing, analyzing, testing, manufacturing, and inspecting airplanes.

b. One of the first significant changes in the standards occurred in March 1956 with the revision of the Fatigue Evaluation requirements contained in Civil Air Regulations (CAR) 4b.270. This revision added “Fail-safe strength” as an option to the “Fatigue strength” approach for addressing fatigue. Motivation for this change was the realization that precluding fatigue cracking from occurring might not always be possible and, therefore, as an option, the structure may be designed to survive cracking. The fatigue strength approach tries to achieve a design where fatigue cracking is not probable within the operational life of the airplane. The fail-safe approach assumes that cracking could occur, while maintaining a specified minimum strength after a “fatigue failure or obvious partial failure” had occurred. The efficacy of the fail-safe approach was not only dependent on the structure keeping the specified minimum strength with the fatigue damage present, but also on finding the damage during normal maintenance. As applied, the fail-safe approach emphasis is on redundancy as opposed to fatigue performance, and inspectability is assumed and not quantified. The fail-safe option was the predominate approach chosen for most large transport category airplanes certified in the 1960s and 1970s.

c. Another significant change in the airworthiness standards for fatigue occurred in October 1978 with Amendment 25-45, when § 25.571 was revised and § 25.573 was deleted. This change involved removing the fail-safe option entirely and establishing a new requirement to develop damage tolerance-based inspections wherever practical. The fatigue strength approach, as a default option, is used only if the damage tolerance approach is impractical. The motivation for the 1978 change was a recognition, based on mounting evidence, that the fail-safe approach applied up to that point was not reliable and would not achieve the desired level of safety. Specific areas of concern with the fail-safe approach included the loss of fail-safety with age. This was because of the increased probability of cracking in the structure adjacent to the fatigue failure, or obvious partial failure, and the lack of directed inspections and quantification of residual life with the assumed damage present. It was agreed at the time that more emphasis was needed on where and how fatigue cracking could occur in the structure, and on quantifying crack growth and residual strength characteristics. This includes damage tolerance characteristics and development of effective inspection protocols, such as where, when, how, and how often to inspect. The 1978 changes achieved this for certification of new transport category airplanes.

d. The same events and reasoning that drove the changes to airworthiness standards for new airplanes also influenced the strategy adopted to ensure the continued airworthiness of

the existing fleet. There was increasing concern about existing older airplanes certified according to the fail-safe requirements of CAR 4b.270. Eleven large transport models were specifically identified as needing the most attention. The FAA determined a need to develop damage tolerance-based inspection programs. These inspections supplement existing maintenance inspections, so these programs were referred to as SSIPs. The inspection requirements were documented in supplemental structural inspection documents (SSIDs). It was also agreed that SSIDs would be developed by the original equipment manufacturers (OEM) on a voluntary basis and then mandated by AD. The Civil Aviation Authority (CAA) for the United Kingdom published guidance for developing the SSIPs in Airworthiness Notice No. 89, *Continuing Structural Integrity of Transport Aeroplanes*, dated August 23, 1978, and by the FAA guidance for developing the SSIPs in AC No. 91-56, *Supplemental Structural Inspection Program for Large Transport Category Airplanes*, dated May 6, 1981. Subsequently, SSIPs were developed and mandated by AD for the eleven aging model airplanes. In developing the SSIDs little or no consideration was given to the effect of the repairs and alterations on inspections required for supplemental inspections. However, later revisions to some SSID ADs addressed supplemental inspection requirements for repairs and alteration to varying degrees.

e. In April 1988 one of the eleven aging model airplanes suffered major structural damage to its pressurized fuselage structure because of undetected fatigue cracking of the baseline primary structure. That airplane had a SSIP that was mandated by AD. The accident was attributed, in part, to the aging of the airplane involved, and precipitated actions that culminated in regulations aimed at avoiding catastrophic failures from fatigue in existing and future airplanes.

f. In response to the April 1988 accident the FAA sponsored a conference on aging airplanes and established a task force representing the interests of the airplane operators, airplane manufacturers, regulatory authorities, and other aviation representatives. This task force specifically recommended consideration of damage tolerance for repairs. In direct response to the recommendations, the FAA adopted changes to parts 91, 121, 125 and 129 in April 2000. These changes required operators to incorporate damage tolerance-based inspections for existing and future repairs to the fuselage pressure boundary for the eleven aging model airplanes previously identified. This did not address other model airplanes or repairs to other structure.

g. The April 1988 accident also precipitated Congressional legislation. In October 1991, Congress enacted Title IV of Public Law 102-143, the *Aging Airplane Safety Act of 1991* (AASA). Two key elements of the AASA are as follows:

(1) Required “the Administrator to make such inspections and conduct such reviews of maintenance and other records of each airplane used by an operator to provide air transportation as may be necessary to determine that such is in a safe condition and is properly maintained for operation in air transportation.”

(2) Specified that an operator must be able to demonstrate, as part of the inspection, “that maintenance of the airplane’s structure, skin, and other age sensitive parts and components have been adequate and timely enough to ensure the highest level of safety.”

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h. Although the AASA did not define specifics of what had to be done, the one clear intent was to avoid catastrophic failures throughout the operational life of each affected airplane because of fatigue. Consistent with this, and the damage tolerance requirements adopted in 1978 for new transport category airplanes, FAA initiated rulemaking that would require broader implementation of damage tolerance-based structural inspection programs. This would apply to almost all multi-engine airplanes used in scheduled passenger service. Additionally, the intent was to address all structure where fatigue cracking could result in catastrophic failure.

i. In response to the AASA, FAA rulemaking efforts eventually resulted in the issuance of the Aging Airplane Safety Interim Final Rule (AASIFR) on December 6, 2002. This rule required implementation of damage tolerance-based inspection programs for all airplanes operated under part 121 and 129 operations. The AASIFR was also applicable to all multi-engine airplanes engaged in part 129 or 135 operations that were initially certificated with 10 or more passenger seats. Airplanes operated between any point within the State of Alaska and any other point within the State of Alaska were exempt from that rule.

j. The AASIFR was subsequently amended and finalized on February 2, 2005, as the Aging Airplane Safety Final Rule (AASFR). The revised rule requires implementation of damage tolerance-based inspection programs by December 20, 2010. This applies to airplanes engaged in part 121 or 129 operations with type certificated passenger seating capacity of 30 or more or a payload capacity of 7,500 pounds or more. Airplanes operated within Alaska remain exempt. Although the scope has been reduced, the AASFR still affects the majority of airplanes engaged in scheduled passenger service. Relative to damage tolerance-based inspection programs, the AASFR raises the level of safety on the existing fleet of affected airplanes to the same level required for current transport category airplane type design approvals.

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APPENDIX 5. APPROVAL PROCESS FOR NEW REPAIRS

In the past, AC 25.1529-1, *Instructions for Continued Airworthiness of Structural Repairs on Transport Airplanes*, August 1, 1991, described a two-stage approach for approving repairs to principal structural elements. The two-stage approach consisted of:

- Evaluating type design strength requirements per § 25.305 before return to service.
- Performing a damage tolerance evaluation and developing DT Data to demonstrate compliance with § 25.571 within 12 months of return to service.

The guidance material in AC 25.1529-1 is now embodied in this AC, and is modified to describe a three-stage approach now commonly used in the aviation industry. The three-stage approach is in lieu of the two-stage approach discussed above.

The DT Data include inspection requirements, such as inspection threshold, inspection method, and inspection repetitive interval, or may specify a time limit when a repair or alteration needs to be replaced or modified. The required data may be submitted all at once, prior to the airplane return to service, or it may be submitted in stages. The following three-stage approval process is available, which involves incremental approval of engineering data to allow an airplane to return to service before all the engineering data previously described are submitted. The three stages are described as follows:

- a. The first stage is approval of the static strength data and the schedule for submittal of the DT Data. This approval is required prior to returning an airplane to service.
- b. The second stage is approval of the DT Data. Unless the FAA agrees to a longer period, the DT Data should be submitted no later than 12 months after the airplane was returned to service. The DT Data might only contain the threshold where inspections are required to begin as long as a process is in place to develop the required inspection method and repetitive intervals before the threshold is reached. In this case, the submittal and approval of the remaining DT Data may be deferred to the third stage.
- c. The third stage is approval of the DT Data not submitted and approved in the second stage. This would typically involve the inspection method and the repetitive intervals. This data would need to be submitted and approved prior to the inspection threshold being reached. Operation beyond the threshold would not be allowed unless the data are submitted to and approved by the FAA.

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APPENDIX 6. ASSESSMENT OF EXISTING REPAIRS

A Damage Tolerance Inspection (DTI) assessment process consists of the following three steps:

1. Airplane Repair Survey. A survey will be used to identify existing repairs and repair configurations on FCBS. The survey would apply to all affected airplanes in an operator's fleet, as defined in the OIP, using the process contained in the Compliance Document. An example of how to establish the timeline for conducting the survey can be found in Appendix 8 of this AC. The procedure to identify repairs that require a DTE should be developed using AC 25.571-1C (using the AC revision level that corresponds to the airplane certification level for § 25.571), together with additional guidance specific to repairs, such as:

- a. Size of the repair,
- b. Repair configuration,
 - (1) SRM standards
 - (2) Other
- c. Proximity to other repairs, and
- d. Potential effect on FCBS
 - (1) Inspectability (access and method)
 - (2) Load distribution.

2. Identification and Disposition of Repairs Requiring Immediate Action. Certain repairs may not meet minimum requirements because of cracking, corrosion, dents, or inadequate design. The operator should use the guidance provided in the Compliance Document to identify these repairs and, once identified, take appropriate corrective action. In some cases, modifications may need to be made before further flight. The operator should consider establishing a fleet campaign if similar repairs may have been installed on other airplanes.

3. Damage Tolerance Inspection Development. This includes the development of DTI for the repair under consideration. During this step determine the inspection method, threshold, and repetitive interval. Obtain the necessary DTI from existing applicable DT Data or from the results of an individual damage tolerance evaluation performed using the guidance in AC 25.571-1C. If the DTI is practical, incorporate the DTI into the individual airplane maintenance program. If the DTI is either impractical or impossible for a particular structural detail, incorporate a replacement time for the repair into the individual airplane maintenance program. The three-stage approach discussed in Appendix 5 of this AC may be used, if appropriate.

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APPENDIX 7.

REPAIRS AND ALTERATIONS TO REMOVABLE STRUCTURAL COMPONENTS

This appendix provides guidance for developing and implementing Damage Tolerance (DT) Data for existing and new repairs and alterations to fatigue critical structure (FCS) on removable structural components. In summary, the guidance covers:

- Methods of determining or assigning the age (in flight hours, flight cycles, or both) to a removable structural component when its original life history is unknown.
- Guidance for tracking removable components that contain FCS.
- Methods for developing DT Data for repairs and alterations to removable components that contain FCS and implementing schedules for incorporating Damage Tolerance Inspections (DTIs) into maintenance programs.
- Options for implementing DT Data for removable components that contain FCS.

For determining the age of a component or tracking structural components, methods other than those given below may be used if approved by the operator's Principal Maintenance Inspector as part of the Operator's Implementation Plan.

a. Determining the Age of a Removable Structural Component. Determining an actual component age or assigning a conservative age provides flexibility and reduces operator burden when implementing DT Data for repairs and alterations to structural components. In some cases, the actual component age may be determined from records. If the actual age cannot be determined this way, the component age may be conservatively assigned using one of the following fleet leader concepts, depending upon the origin of the component:

- (1) If component times are not available, but records indicate that no part changes have occurred, airplane flight cycles or flight hours can be used.
- (2) If no records are available, and the parts could have been switched from one or more older airplanes under the same maintenance program, it should be assumed that the time on any component is equal to the oldest airplane in the program. If this is unknown, the time should be assumed equal to the same model airplane that is the oldest or has the most flight cycles or flight hours in the world fleet.
- (3) A manufacturing date marked on a component may also be used to establish the component's age. This can be done by using the above reasoning and comparing it to airplanes in the affected fleet with the same or older manufacturing date.

If none of these options can be used to determine or assign a component age or total number of flight cycles or flight hours, a conservative implementation schedule can be established

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by using the guidelines applied in paragraph c of this appendix, for the initial inspection, if required by the DT Data.

b. Tracking. An effective, formal, control or tracking system should be established for removable structural components that are identified as FCBS or that contain FCS. This will help ensure compliance with maintenance program requirements specific to repairs and alterations installed on an affected removable structural component. Paragraph d of this appendix provides options that could be used to alleviate some of the burdens associated with tracking all repairs to affected removable structural components.

c. Developing and Implementing DT Data:

(1) Existing Repairs and Alterations – Components Installed Prior to December 20, 2010. Do the initial inspection on an affected component according to the schedule in paragraphs c(1)(a), c(1)(b) and c(1)(c) of this appendix.

Repairs: Accomplish the initial repair assessment of the affected structural component at the same time as the airplane level repair survey for the airplane on which the component is installed. Develop the DT Data per the process given in step 3 of Appendix 6 and incorporate the DTI into the maintenance program.

Alterations: Accomplish the initial alteration assessment of the affected structural component at the same time as the airplane level alteration assessment for the airplane on which the component is installed. Develop the DT Data and incorporate the DTI into the maintenance program.

(a) If the actual age of the repairs or alterations installation, or the total number of flight cycles or flight hours is known, use that information to establish when the initial inspection of the component should be performed. Repeat the inspection at the intervals provided by the TC or STC Holder for the repair or alteration installed on the component.

(b) If the actual age of the repairs or alterations installation, or the total number of flight cycles or flight hours is unknown, but the component age or total number of flight cycles or flight hours is known, or can be assigned conservatively, use the component age, or total number of flight cycles or flight hours, to establish when the initial inspection of the component should be performed. Repeat the inspection at the intervals provided by the TC or STC Holder for the repairs and alterations against the component.

(c) As an option, accomplish the initial inspection on the affected component at the next C-check (or equivalent interval) following the repair assessment. Repeat the inspection at the intervals provided by the TC or STC Holder for the repairs and alterations against the component.

(2) Existing Repairs and Alterations – Components Retrieved from Storage after December 20, 2010. For components retrieved from storage and

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installed after December 20, 2010, that have not previously had DTE performed and DTI implemented, develop and implement DT Data as follows:

(a) If the time on the component (in flight cycles or flight hours) is known, or can be conservatively assigned, perform the following:

- 1** Survey the component,
- 2** Disposition the repairs and alterations,
- 3** Implement any DTI in accordance with the schedule in Chapter 2 or 3 of this AC, using the component's age, and
- 4** Accomplish the initial inspection using the actual age of the repairs or alterations, or total number of flight cycles or flight hours, if known. If the age of the repairs or alterations is not known, use the component age. Repeat the inspection at the intervals given for the repairs or alterations against the component.

(b) If the time on the component (in flight cycles or flight hours) is unknown and cannot be conservatively assigned, perform the initial repair or alteration assessment of the affected component prior to installation, and take the following actions:

- 1** Develop the DT Data per the process given in Chapter 2 or 3 of this AC, as applicable.
- 2** Incorporate any DTI into the maintenance program.
- 3** Accomplish the first inspection on the affected component at the next C-check (or equivalent interval) following the repair or alteration assessment.
- 4** Repeat the inspection at the intervals given for the repair or alteration against the component.

(3) New Repairs and Alterations. New repairs and alterations to affected removable structural components installed after December 20, 2010, must have a DTE performed and DTIs implemented according to an approved process. For repairs, that process is described in Appendix 5 of this AC. Perform the initial and repetitive inspections at the intervals given for the repair or alteration against the component.

d. Implementation Options to Help Reduce Tracking Burden. The following implementation techniques may be used to alleviate some of the burdens associated with tracking repairs to affected removable structural components. These techniques, if used, would need to be included in the OIP and may require additional FAA approval and TC or STC Holder input for DTIs.

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Appendix 7**(1) Upgrading Existing Repairs.**

(a) As an option, existing repairs may be removed and replaced to zero time the DTI requirements of the repair and establish an initial tracking point for the repair. Normally, this would be done at or before the survey for maximum benefit. The initial and repetitive inspections for the upgraded repair would then be accomplished at the intervals given for the repair against the component.

(b) A repair could also be upgraded to one whose inspection requirements and methods are already fulfilled by a part 121 or part 129 operator's maintenance or inspection program (see paragraph 406 of this AC). That repair would then be repetitively inspected at each routine inspection interval applicable to the repair. Specific tracking would not be required because that area of the airplane would already be normally inspected on each airplane in the fleet as part of the existing approved maintenance program. If the operator's program intervals were changed, the effect on requirements for specific tracking would have to be re-evaluated.

(2) Special Initial and/or Routine Inspections.

(a) As an option, existing repairs may have special initial inspections accomplished during the component survey. This initial inspection establishes an initial tracking point for the repair. Following this initial inspection, the DTI requirements (e.g., repetitive inspections) of the repair would be implemented.

(b) In addition, special routine inspections could be defined for typical repairs that could be applied at a normal interval. In this case, an operator could check the affected components on each airplane for this type of a repair at the defined interval. If the repair was found, the special inspection would be applied to ensure its airworthiness until the next scheduled check. This alleviates the need to specifically track affected components for every repair, especially typical ones.

(c) The development of inspection processes, methods, applicability and intervals would most likely require the assistance of the TC or STC Holder for the FCS in question. In all circumstances, the data must be approved by the FAA Oversight Office.

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APPENDIX 8. PROGRAM IMPLEMENTATION EXAMPLES

The following are provided to assist the operator in understanding the timeline for when the program should be implemented. Two examples are given, one covers airplanes below 75 percent of the design service goal (DSG) on December 18, 2009, and the other is for airplanes beyond the DSG on December 18, 2009.

a. Airplane Below 75 Percent of the DSG on December 18, 2009. Operators should complete a survey at the first heavy maintenance check (time limit equivalent to a “D-check”) after the airplanes reach 75 percent of the DSG, and not to exceed the DSG.

Consider the following:

- (1) Airplane Total Flight Cycles on December 18, 2009, – 55,000
- (2) DSG = 75,000 Cycles, 75percent DSG – 56,250 Flight Cycles
- (3) Time of last “D”-Check Equivalent – 53,000 Flight Cycles
- (4) 8-Year “D”-Check Equivalent – 365 Days/Year, 4 cycles/day = 11,680 Flight Cycles

The survey would be performed after the airplane has reached 56,250 total flight cycles (75% DSG) and would be due before the airplane has accumulated 11,680 flight cycles (D-check equivalent) beyond the time of the last D-check (53,000 flight cycles). Therefore, the survey would be due before the airplane has reached 64,680 total flight cycles, but in any case would be required before the airplane has reached 75,000 total flight cycles (DSG).

b. Airplane Beyond the DSG on December 18, 2009. Operators complete a survey of these airplanes at or before the next heavy maintenance check (equivalent to a D-check) after December 20, 2010, not to exceed 6 years.

Consider the following:

- (1) Airplane Total Flight Cycles on December 18, 2009, – 80,000
- (2) DSG = 75,000 Cycles, 75percent DSG – 56,250 Flight Cycles
- (3) Time of last “D”-Check Equivalent – 78,540 Flight Cycles, conducted in Jan 2009
- (4) 8-Year “D”-Check Equivalent – 365 Days/Year, 4 cycles/day = 11,680 Flight Cycles
- (5) Assume maximum total flight cycles accumulated by December 20, 2010, to be 81,460 (80,000 flight cycles on 12/18/2009 + 1,460 flight cycles/year).

Consider an airplane that has 80,000 total flight cycles as of December 18, 2009, and a DSG of 75,000 total flight cycles. The airplane is currently on an 8-year D-check equivalent and the last D-check was performed in January 2009 at 78,540 total flight cycles. The survey would need to be performed prior to the airplane accumulating 11,680 flight cycles (D-check equivalent) beyond the time of the last D-check (78,540 flight cycles) or 6 years,

whichever occurs first. Therefore, the survey would be due before the airplane has reached 90,220 total flight cycles or 6 years, whichever occurs first, based on the airplane utilization

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of 4 cycles/day, a 365-day year, and a maximum total of 81,460 flight cycles as of December 20, 2010.

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APPENDIX 9. LIST OF SIGNIFICANT ALTERATIONS THAT MAY ADVERSELY AFFECT FATIGUE CRITICAL STRUCTURE

- 1.** Passenger-to-freighter conversions (including addition of main deck cargo doors).
- 2.** Gross weight increases (increased operating weights, increased zero fuel weights, increased landing weights, and increased maximum takeoff weights).
- 3.** Installation of fuselage cutouts (passenger entry doors, emergency exit doors or crew escape hatches, fuselage access doors, and cabin window relocations).
- 4.** Complete re-engine or pylon alterations.
- 5.** Engine hush-kits.
- 6.** Wing alterations such as installing winglets or changes in flight control settings (flap droop), and alteration of wing trailing edge structure.
- 7.** Modified skin splices.
- 8.** Antenna Installations.
- 9.** Any alteration that affects several stringer or frame bays.
- 10.** An alteration that covers structure requiring periodic inspection by the operator's maintenance program.
- 11.** An alteration that results in operational mission change that significantly changes the manufacturer's load or stress spectrum (e.g., passenger-to-freighter conversion). Examples of this type of alteration may be an alteration that adds new structural splices, or increases the operational loads causing existing structure to become fatigue critical.
- 12.** An alteration that changes areas of the fuselage which prevents external visual inspections (for example, the installation of a large external fuselage doubler that results in hiding details beneath it).
- 13.** In general, attachment of interior monuments to fatigue critical structure. Interior monuments include large items of mass such as galleys, closets, and lavatories.