



**FAA**  
**Flight Standards Service**  
**Aviation Maintenance Division AFS-300**

## **Job Aid**

### **Major Repair and Alteration Data Approval**

REFERENCE ONLY

## AFS-300 MAJOR REPAIR/ALTERATION JOB AID INTRODUCTION AND MAIN MENU

### **Introduction**

This job aid provides a table of the approval method classifications for major repairs and alterations and is associated with the other sources of guidance that address data approval.

For ease of use the table is divided into sections that correspond to the products and categories and are accessed through the provided menus.

Additional or expanded information is provided through links located and identified in the table or through menus.

### **Using the Field Approval Job-Aid**

- 1) From the main menu select the certification basis of the product being repaired or altered and then the appropriate submenu.
- 2) Locate the specific system or alteration from within the table.
- 3) The approval path is designated for each item.
- 4) Many items have additional guidance or information that is accessible using provided links.
- 5) All Items for which further guidance or information is available are identified in the table by this symbol:

- 6) Access the linked information by clicking on the symbol.

### **Navigating This Document**

Bookmarks have been provided in this document. To view, click on the bookmark icon at the left of the window.

The application provides a toolbar that has page navigation tools for paging forward and backward as well as previous and next view buttons. The page navigation tools may have to be activated for your version. For detailed information about navigating .pdf documents and activating toolbar options select "Help"

Examples of activating the navigation tools for Acrobat 9 and 10 are provided here:

For your convenience a  
of this document.

button has been provided on the pages

### **Feedback**

A feedback form is provided and can be accessed from the main menu.

### **Revision**

Revision of this job aid is to be accomplished using the procedure defined in AFS-300 Standard Operating Procedure (SOP) AFS-300-010-SOP-G1, as revised.

AFS-300 MAJOR REPAIR/ALTERATION JOB AID  
INTRODUCTION AND MAIN MENU

MAIN MENU

**ELIGIBILITY CONSIDERATIONS FOR FIELD APPROVALS**

**NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY  
AIRPLANES**

**TRANSPORT CATEGORY AIRPLANES**

**NORMAL AND TRANSPORT CATEGORY ROTORCRAFT**

**ENGINE, PROPELLER, AND APU**

**GENERAL GUIDANCE AND INFORMATION**

**SPECIFIC GUIDANCE AND INFORMATION**

**FEEDBACK FORM**

## AFS-300 MAJOR REPAIR/ALTERATION JOB AID INTRODUCTION AND MAIN MENU

### **Eligibility Considerations for Field Approval**

The following lists indicate which method(s) may be used for approving major alterations to type certificated (TC) and Supplemental Type Certificated (STC) products. These lists are not all-inclusive, and each alteration should be evaluated on a case-by-case basis. Consult each section that concerns your product. Additionally, aviation safety inspectors (ASI) should review current notices, advisory circulars (AC), etc., for specific types of installations that have been identified as candidates for field approval. The legend is as follows:

**1.** Items with the letters “STC” require an STC. With the complexity of broad applications concerning major alterations, inspectors occasionally encounter a situation in which the guidance material requires application for an STC, but the applicant feels the change doesn't warrant approval as a major change to the product's type design. In those instances, the applicant may request assistance from the Flight Standards District Office (FSDO) to obtain a reclassification for the specific alteration. If the FSDO supports the reclassification believes further consideration is warranted, the FSDO must coordinate the request with the appropriate Aircraft Certification Office (ACO) either by phone or email.

If the ACO determines that the reclassification request should be considered, the ACO must obtain concurrence from the appropriate product directorate and Aircraft Engineering Division (AIR-100) for the reclassification. The ACO will provide the Aircraft Certification Service (AIR) position on the reclassification request and document the directorate and AIR-100 concurrence in writing to the FSDO (email preferred). This concurrence must be referenced on the FAA Form 337 prior to issuing the field approval or documenting the alteration with approved data. Reclassification decisions will be monitored and the data used to improve the descriptions and criteria in the job aid.

**2.** Items designated ‘Evaluation’ by the letters “EVL” may be eligible for approval by means other than a STC, depending on the scope and complexity of the alteration. These items will not automatically qualify for a field approval; they require evaluation and review of guidance to determine if the field approval process may be applied and is appropriate. The ASI may seek assistance from the ACO if necessary in making determinations of items listed as “EVL”.

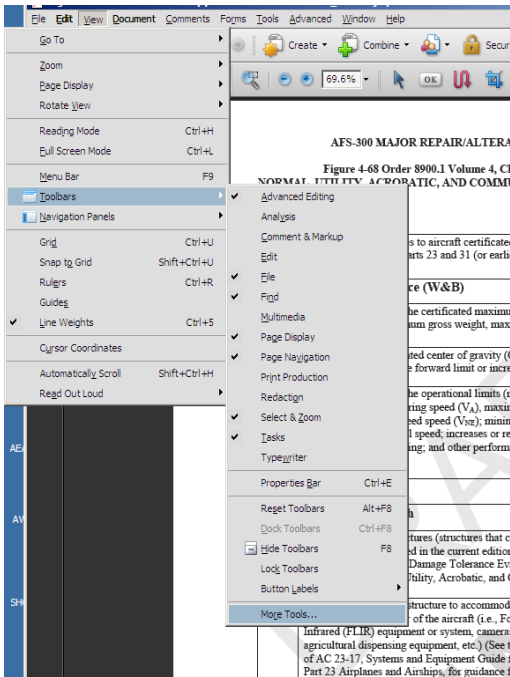
**3.** Items designated “Engineering” by the letters “ENG” may be eligible for approval by means other than a STC, but require FAA approved data. This data may be obtained from a Designated Engineering Representative (DER), Organization Designation Authorization (ODA) approved engineering data or through ACO coordinated field approval.

# AFS-300 MAJOR REPAIR/ALTERATION JOB AID

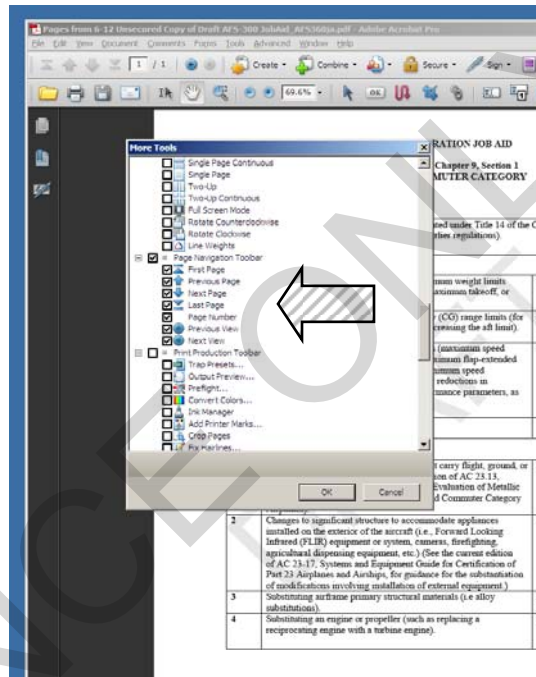
## PAGE NAVIGATION

The available page navigation tools simplify use of the job aid. Procedure for activating the tools is provided here for Acrobat version 9 on this page and version 10 on the next.

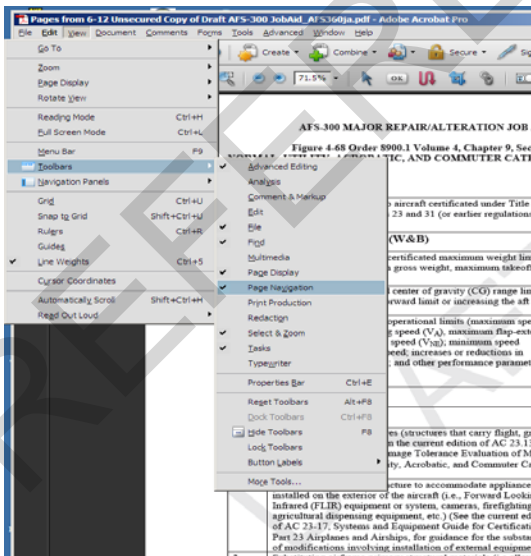
Activate the page navigation tools in Acrobat Version 9



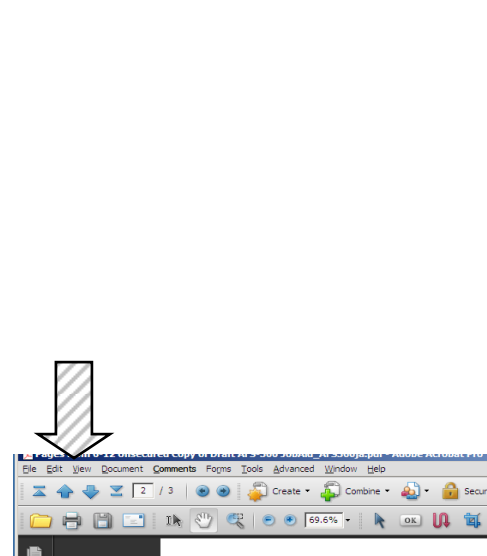
From the View menu select;  
Toolbars > More Tools



Scroll to Page Navigation Toolbar and select  
desired navigation tools



From the View menu select  
Toolbars > Page Navigation



The selected navigation tools are  
now active

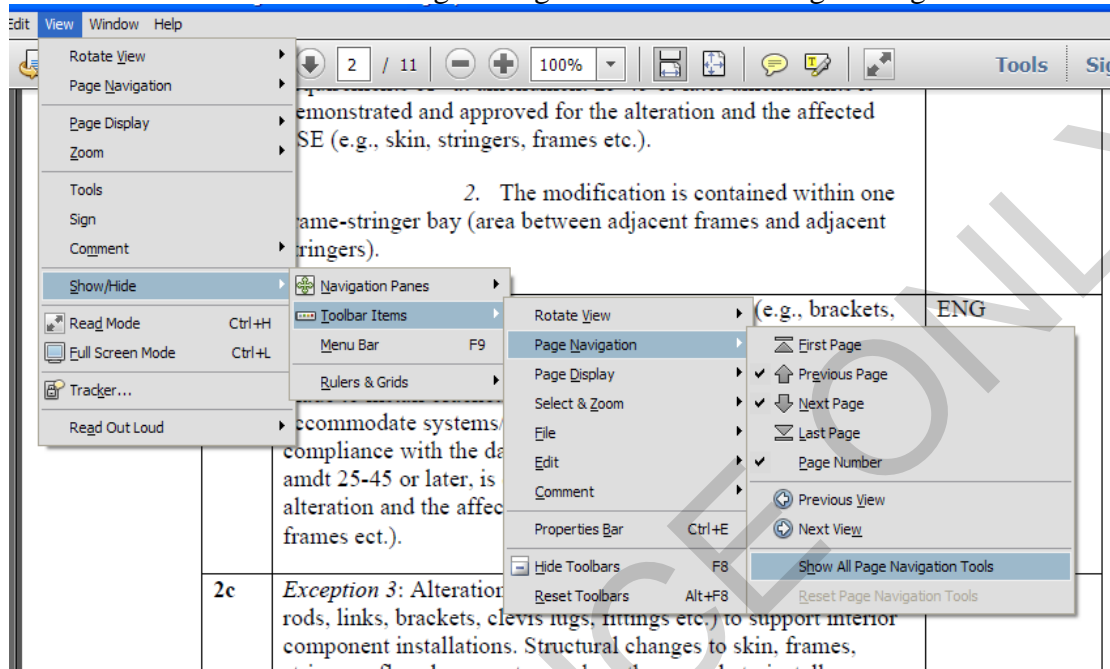
# AFS-300 MAJOR REPAIR/ALTERATION JOB AID

## PAGE NAVIGATION

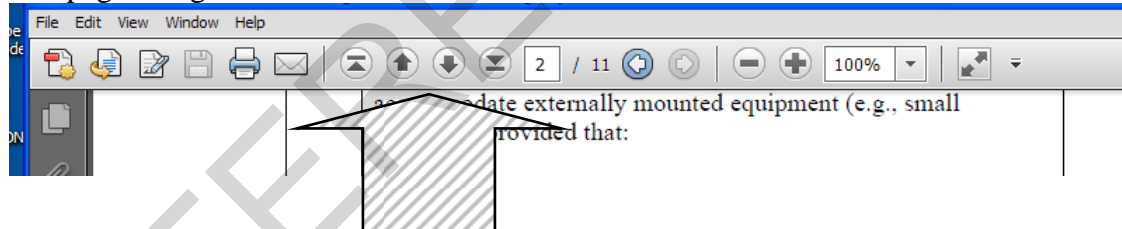
Activate the page navigation tools in Acrobat Version 10

From the View menu select;

Show/Hide > Toolbar Items > Page Navigation > Show All Page Navigation Tools



The page navigation tools are now active on the toolbar



**AFS-300 MAJOR REPAIR/ALTERATION JOB AID  
LINKS TO GENERAL GUIDANCE AND INFORMATION**

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**NOTE: The links in this menu are provided here for convenience. This menu is not an all-inclusive list of applicable guidance. Applicable guidance is determined by the particulars of each repair or alteration.**

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**AC 43-210  
STANDARDIZED PROCEDURES FOR REQUESTING FIELD APPROVAL OF  
DATA, MAJOR ALTERATIONS, AND REPAIRS**

**AC 43.13-1B  
ACCEPTABLE METHODS, TECHNIQUES, AND PRACTICES  
- AIRCRAFT INSPECTION AND REPAIR**

**AC 43.13-2B  
ACCEPTABLE METHODS, TECHNIQUES, AND PRACTICES  
- AIRCRAFT ALTERATIONS**

**AC 21-47  
SUBMITTAL OF DATA TO AN ACO, A DER OR AN ODA FOR A MAJOR  
REPAIR OR A MAJOR ALTERATION**

**AC 23-27  
PARTS AND MATERIALS SUBSTITUTION FOR VINTAGE AIRCRAFT**

**AC 120-27E  
AIRCRAFT WEIGHT & BALANCE CONTROL**

**WEIGHT & BALANCE HANDBOOK**

**ELECTRICAL LOAD ANALYSIS**

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID  
GENERAL GUIDANCE AND INFORMATION**

**ELECTRICAL LOAD ANALYSIS**

The purpose of an electrical load analysis is to determine that the demand on the aircraft's electrical system does not result in the undesirable situation that, during operations in the most adverse circumstances, the electrical system would be inadequate in meeting those system demands or where the emergency reserves are insufficient to meet the requirements during an emergency.

An electrical load analysis is a complete and accurate analysis of available aircraft power and all electrical loads under the most adverse operating conditions during taxi, takeoff and climb, slow cruise, normal cruise, and landing, operations.

Anyone performing an alteration that may have an effect on the aircraft electrical power system must determine that the system has the capacity to accommodate that change.

The operating rules applicable to a specific aircraft may set electrical load requirements above those of the basic certification requirements.

An ELA needs to be performed to establish the baseline electrical capacity of the aircraft. The form this analysis takes will be dependant on the type, age and complexity of the aircraft. From this baseline, it can be determined whether the modification is viable and remains compliant with the applicable standards.

The aircraft manufacturer's original ELA applies only to the original delivered configuration.

Detailed information on the creation or revision of an ELA is provided by ASTM F2490-05e1, AC 43.13-1B and MIL-E-7016 as amended.

When evaluating a data package for an approval, ensure that an ELA has been accomplished and is referenced on the Form 337.



**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY  
AIRPLANES**

**MENU**

The following list applies to aircraft certificated under Title 14 of the Code of Federal Regulations (14 CFR) parts 23 and 31 (or earlier regulations), Special Federal Aviation Regulation (SFAR) 41, or Joint Aviation Regulation (JAR) 22.

**Click to select**

REFERENCE ONLY

## AFS-300 MAJOR REPAIR/ALTERATION JOB AID

### Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1 NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY AIRPLANES.

|  |   |     |
|--|---|-----|
| NOTE: The following list applies to aircraft certificated under Title 14 of the Code of Federal Regulations (14 CFR) parts 23 and 31 (or earlier regulations). |   |     |
| <b>A</b>   | <b>Weight and Balance (W&amp;B)</b>   |     |
| <b>1</b>   | Changes that increase the certificated maximum weight limits (increases in the maximum gross weight, maximum takeoff, or landing weights).  | STC |
| <b>2</b>   | Changes in the certificated center of gravity (CG) range limits (for example, decreasing the forward limit or increasing the aft limit).  | STC |
| <b>3</b>   | Changes that increase the operational limits (maximum speed limits such as maneuvering speed ( $V_A$ ), maximum flap-extended speed ( $V_{FE}$ ), never-exceed speed ( $V_{NE}$ ); minimum speed limitations, such as stall speed; increases or reductions in certificated service ceiling; and other performance parameters, as affected).   | STC |
|  |   |     |
| <b>B</b>   | <b>Structural Strength</b>  |     |
| <b>1</b>   | Changing primary structures (structures that carry flight, ground, or pressure loads as defined in the current edition of AC 23-13, Fatigue, Fail-Safe, and Damage Tolerance Evaluation of Metallic Structure for Normal, Utility, Acrobatic, and Commuter Category Airplanes).   | ENG |
| <b>2</b>   | Changes to significant structure to accommodate appliances installed on the exterior of the aircraft (i.e., Forward Looking Infrared (FLIR) equipment or system, cameras, firefighting, agricultural dispensing equipment, etc.) (See the current edition of AC 23-17, Systems and Equipment Guide for Certification of Part 23 Airplanes and Airships, for guidance for the substantiation of modifications involving installation of external equipment.) | ENG |
| <b>3</b>   | Substituting airframe primary structural materials (i.e alloy substitutions).   | ENG |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY  
AIRPLANES.**

|   |  |     |
|---|--|-----|
| <b>4</b>  | Substituting an engine or propeller (such as replacing a reciprocating engine with a turbine engine).  | STC |
| <b>5</b>  | Substituting or altering a reciprocating engine such that the net result is an increase of more than 10 percent greater horsepower.<br><br>NOTE: If such a change involves an increase to the engine's type design rated power then the evaluation should include whether or not an STC may be needed for changes to the engine. | STC |
| <b>6</b>  | Effects from changes above that affect flutter and vibration for any of the aforementioned changes.  | STC |
| <b>7</b>  | Structural reinforcements not affecting flutter (i.e. using the same material specified by the manufacturer of the next thicker size).   | EVL |
| <b>8</b>  | Substituting blind fasteners in primary load structures.   | ENG |
| <b>9</b>  | Altering passenger-carrying aircraft to an all-cargo or combination configuration.   | STC |
| <b>10</b>   | Interior reconfigurations from one passenger configuration to another or one cargo configuration to another cargo configuration.   | ENG |
| Note: All field approvals for blind fasteners (Cherry Max, or equivalent) in primary load structures must be coordinated with the ACO or supported by DER or ODA approved data. |  |     |
| <b>C</b>  | <b>Reliability</b>   |     |
| <b>1</b>  | Changes to manifolding, air induction systems or air intake doors, engine cowling, or baffle that affect the flow of engine cooling air and carburetor/fire ignition heat rises.   | ENG |
| <b>2</b>  | Changes to the basic engine or propeller design, or controls, that affect the product operating limitations.   | STC |
| <b>2a</b>   | Changes to the basic engine or propeller design, controls that <i>do not</i> affect the products operating limitations.  | ENG |

## AFS-300 MAJOR REPAIR/ALTERATION JOB AID

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY  
AIRPLANES.**

|           |   |     |
|-----------|---|-----|
| <b>3</b>  | Changes that include engine/propeller adjustments and settings limitations that affect power output.  | ENG |
| <b>4</b>  | Modifications to approved avionics equipment that affect functionality, reliability and/or airworthiness, such as:  |     |
| <b>4a</b> | Deviating from the component manufacturer's specific operating limitations.   | ENG |
| <b>4b</b> | Changes to operating system or imbedded software applications. This does not include navigation, terrain, synthetic vision system, and surface navigation/guidance databases.   | STC |
| <b>4c</b> | Changes to airplane structural, physical, electrical properties, or equipment that could adversely affect Reduced Vertical Separation Minimum (RVSM) systems and airplane performance.  | ENG |
| <b>4d</b> | Altering wiring, shielding, or bonding that may adversely affect protection against High Intensity Radiated Fields (HIRF) and electromagnetic interference (EMI) or lighting diversion or suppression.  | EVL |
|           |   |     |
| <b>D</b>  | <b>Operational Characteristics</b>  |     |
| <b>1</b>  | Changes or relocation of systems (including hydraulic, oil, and fuel systems) and equipment that affect structural integrity, flight, ground handling characteristics, or noise/acoustics of the aircraft.  | ENG |
| <b>2</b>  | Changes that alter the movable control surfaces that affect the dynamic and/or static balance, alter the aerodynamic contour of movable control surfaces, or change the weight distribution.  | STC |
| <b>3</b>  | Changes in control surface travel, control system mechanical advantage, location of control system component parts, or direction of motion.   | ENG |
| <b>4</b>  | Changes in basic dimensions or external aerodynamic contour/configuration of the aircraft such as wing and tail planform or incidence angles, canopy, contour or radii, the location of wing and tail fairings, winglets, wing lift struts, tiptanks, windows, and doors. | ENG |
| <b>5</b>  | Changes in canopies, windows, and doors on unpressurized aircraft.  | ENG |

## AFS-300 MAJOR REPAIR/ALTERATION JOB AID

### Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1 NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY AIRPLANES.

|            |  |     |
|------------|--|-----|
| <b>6</b>   | Changes in engine cowlings that do not affect the flow of engine cooling air and carburetor/fire/ignition heat rises.  | EVL |
| <b>7</b>   | Changes to flight-critical electrical/electronic equipment and systems such as electronic flight controls or the engine control system, full-authority digital electronic control (FADEC), electronic engine control (EEC), or fly-by-wire.          | STC |
| <b>8</b>   | Changes that affect aircraft performance, drag, engine power, revolutions per minute (rpm), or exhaust muffler.  | ENG |
| <b>9</b>   | Changes that increase the differential pressure limits of an atmospheric or climatic control system of aircraft interior compartments.   | STC |
| <b>10</b>  | Changes in engine and propeller combination (vibration approval).  | ENG |
| <b>11</b>  | Changes affecting noise.   | ENG |
| <b>12</b>  | Changes affecting flight characteristics.  | ENG |
| <b>13</b>  | Installation of:   |     |
| <b>13a</b> | Avionics systems that perform critical functions, other than installation of basic attitude, altitude, and airspeed instruments, or are highly integrated with complex switching interfaces with other equipment and systems                         | STC |
| <b>13b</b> | Avionics systems installed under an approved model list (AML) STC that do not conform to the type design established at the time of certification or which require assessment caused by a deviation in location of ancillary components or equipment | EVL |
| <b>13c</b> | Using new or different alternators, generators, starters, or vacuum pumps on reciprocating engines only.   | EVL |
| <b>13d</b> | Health Usage Monitoring Systems (HUMS) or Data Transfer Units (DTU)  | ENG |
| <b>13e</b> | Head-up display (HUD), enhanced flight vision systems (EFVS), or Synthetic Vision Systems (SVS) used for primary navigation  | STC |

## AFS-300 MAJOR REPAIR/ALTERATION JOB AID

### Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1 NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY AIRPLANES.

|               |   |     |
|---------------|---|-----|
| <b>13f</b>    | Traffic collision alerting device (TCAD), traffic advisory systems (TAS), Traffic Alert and Traffic Alert and Collision Avoidance System I (TCAS I) (see Information for Operators (InFO) 08047).   | EVL |
| <b>13g</b>    | TCAS II.  | STC |
| <b>13h</b>    | Autopilots (AP), Flight Guidance Systems, and automatic flight control systems (AFCS) or flight directors (FD)  | STC |
| <b>13h(1)</b> | Simple single-axis autopilot systems with limited control authority that are not required for operation of the airplane, such as a simple wing leveler system. An engineering analysis with the ACO should be done to determine the appropriate level of FAA involvement, based on intended function, installation complexity, and potential failure effects.   | ENG |
| <b>13i</b>    | Cockpit voice recorders (CVR) and associated interfaces.  | EVL |
| <b>13j</b>    | Flight data recorders (FDR) and associated sensors or digital flight data acquisition units (DFDAU) required by operating rule.   | STC |
| <b>13j(1)</b> | Installation of recording devices that do not substantially interface with other aircraft systems, control surfaces, etc. and are not required by operational rule or required to support a continued operational safety program (such as determination or extension of structural life limits), it is unlikely an STC is necessary. An engineering analysis with the ACO should be done to determine the appropriate level of FAA involvement, based on intended function, installation complexity, and potential failure effects. | ENG |
| <b>13k</b>    | Electronic flight instrument systems (EFIS).  | STC |
| <b>13l</b>    | Electronic horizontal-situation indicators (EHSI). (See the current edition of AC 23.1311-1, Installation of Electronic Display in Part 23 Airplanes, and InFO 08047.)  | EVL |
| <b>13m</b>    | Ground proximity warning systems (GPWS).  | STC |
| <b>13n</b>    | Terrain Awareness and Warning Systems (TAWS-A). (See the current edition of AC 23-18, Installation of Terrain Awareness and Warning System (TAWS) Approved for Part 23 Airplanes, and InFO 08047.)  | EVL |

## AFS-300 MAJOR REPAIR/ALTERATION JOB AID

### Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1 NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY AIRPLANES.

|            |  |     |
|------------|--|-----|
| <b>13o</b> | Terrain Awareness and Warning Systems (TAWS-B). (See AC 23-18 and InFO 08047.)   | EVL |
| <b>13p</b> | Emergency Vision Assurance System (EVAS).  | STC |
| <b>13q</b> | Mounting fixtures or brackets for portable devices such as Global Positioning System (GPS) or Electronic Flight Bag (EFB).<br><br>NOTE: Follow evaluation guidance provided in FAA Policy Statement PS-ACE-23-01 (click INFO icon to view).  | EVL |
| <b>13r</b> | GPS or Global Navigation Satellite System (GNSS). (See AC 20-138, Airworthiness Approval of Positioning and Navigation Systems, and InFO 08047.)<br><br>NOTE: Field approval of coupled Localizer Performance with Vertical guidance ( <b>LPV</b> ) may be issued for compatible autopilots/flight guidance systems identified by the initial STC holder or the equipment and system manufacturer.   | EVL |
| <b>13s</b> | Multi-sensor Navigation System (including Navigation Management Systems (NMS) and flight management systems (FMS)). (See the current edition of AC 20-138 and InFO 08047.)<br><br>NOTE: Field approval of coupled LPV may be issued for compatible autopilots/flight guidance systems identified by the initial STC holder or the equipment and system manufacturer.   | EVL |
| <b>13t</b> | Multifunction displays (MFD) or Electronic Map Displays (EMD) (see AC 23.1311-1).<br><br>NOTE: MFDs, EMDs, or similar electronic displays are systems that are capable of depicting graphic information (e.g., engine instrumentation, TAS, TCAS, TAWS, terrain, moving map, weather detection, weather radar, windshear, etc.) from multiple sensors that have been demonstrated to meet applicable minimum performance standards or that are produced under Technical Standard Order Authorization (TSOA). When used to display primary flight information to meet regulatory operating requirements, the manufacturer or installer must ensure that such information, as it is scheduled to be depicted, is prioritized as to its importance in critical flight phases so that, for example, TAWS or terrain contours and/or alerts are depicted near terrain or obstructions, windshear alerts are depicted on approach or | ENG |

## AFS-300 MAJOR REPAIR/ALTERATION JOB AID

### Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1 NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY AIRPLANES.

|             |  |     |
|-------------|--|-----|
|             | departures to airports below 900 feet above ground level (AGL), or weather radar is displayed, unless overridden by TAS or TCAS, in environments with threatening proximate traffic, etc.  |     |
| <b>13u</b>  | Electronic Flight Bag (EFB) Class 1 and Class 2 mounting devices, data connectivity and aircraft power connections. See the current edition of AC 120-76, Guidelines for the Certification, Airworthiness, and Operational Approval of Electronic Flight Bag Computing Devices.<br><br>NOTE: Class 1 and Class 2 EFB units themselves are considered to be portable electronic devices (PED) and do not require installation approval. | ENG |
| <b>13v</b>  | EFB Class 3 employing Type A, B and/or C software applications. (See AC 120-76 and FAA Order 8900.1 for instructions.)   | STC |
| <b>13w</b>  | Night vision goggles (NVG) environments including existing lighting and Night Vision Imaging System (NVIS) arrays.   | STC |
| <b>13x</b>  | Forward Looking Infrared (FLIR), Light Detection and Ranging (LIDAR), or airborne surveillance systems incorporating visible and non-visible laser pointer, range finder, and laser illumination devices (Class IIIb and Class IV, as rated by the Food and Drug Administration (FDA)).  | STC |
| <b>13y</b>  | High-Intensity Discharge (HID) lamps and power supplies must have been issued STC for a particular make and model airplane and Parts Manufacturer Approval (PMA) supplement lists' specific eligibility for installation of HID as supplemental lighting only.   | ENG |
| <b>13z</b>  | HID lighting installed and intended for use as primary lighting required to meet performance under the airworthiness standards requires approval by STC.   | STC |
| <b>13aa</b> | Anti-terrorism countermeasures, including flares and dispensing systems.   | STC |
| <b>13bb</b> | Automatic Dependent Surveillance-Broadcast (ADS-B).  | STC |
| <b>14</b>   | Any alteration that requires flight testing to show compliance with the regulations (not applicable to operational flights following maintenance and alterations conducted under § 91.407(b)).   | ENG |
|             |  |     |



**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY  
AIRPLANES.**

| <b>E</b>  | <b>Changes to Systems that Affect Aircraft Airworthiness, Such as:</b>   |     |
|-----------|--|-----|
| <b>1</b>  | Changes to landing gear and related components, such as internal parts of shock struts, length, geometry of members, brake and brake systems, or additions.                | EVL |
| <b>2</b>  | Changes to an existing or installation of a new icing protection system.   | STC |
| <b>3</b>  | Changes to or relocation of exterior fuel vents, fuel drains, or battery vents. (Applicable to components not attached to the basic engine.)                               | EVL |
| <b>4</b>  | Changes to crew or passenger liquid oxygen (LOX) or onboard generating systems.  | ENG |
| <b>5</b>  | Changes to external, critical access doors, auxiliary power unit (APU) ram air, nacelle blowout doors, fuel drain.   | ENG |
| <b>6</b>  | Changes to oil, hydraulic, pneumatic, and fuel lines, or systems that affect their operation or installation and flammability requirements, such as:                       |     |
| <b>6a</b> | New types of hoses and/or hose fittings that may not meet installation requirements, such as flow rate and flammability requirements.                                      | ENG |
| <b>6b</b> | New type fuel dump valves.   | EVL |
| <b>6c</b> | New oil/fuel/hydraulic line materials beyond the scope of the current edition of AC 43.13-1, Acceptable Methods, Techniques, and Practices—Aircraft Inspection and Repair. | EVL |
| <b>6d</b> | Change to, or addition of, permanent fuel tanks or fuel system components, including sealants.   | ENG |
| <b>7</b>  | Changes in fixed fire extinguisher or detector systems that affect the system's effectiveness or reliability, such as:   |     |
| <b>7a</b> | Relocating discharge nozzles, detector units, or fixed fire extinguisher bottles.  | ENG |
| <b>7b</b> | Using new or different detector components.  | ENG |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY  
AIRPLANES.**

|           |  |     |
|-----------|--|-----|
| <b>7c</b> | Decreasing the amount or changing the type of extinguishing agents.  | ENG |
| <b>8</b>  | Alterations or repairs that include:   |     |
| <b>8a</b> | Changes that include substituting airframe materials that affect structural integrity, lightning protection, HIRF protection, flight characteristics or performance.   | ENG |
| <b>8b</b> | Use of synthetic covering materials.   | EVL |
| <b>8c</b> | Use of new titanium or magnesium applications.   | ENG |
| <b>8d</b> | Use of ceramic coatings.   | ENG |
| <b>8e</b> | Use of synthetic coatings.   | ENG |
| <b>8f</b> | Use of new plated coatings.  | ENG |
|           |  |     |
| <b>F</b>  | <b>Crashworthiness</b>   |     |
| <b>1</b>  | Changes to the aircraft structure, cabin interiors, seating configuration, or equipment relocation that affect crashworthiness and/or emergency evacuation. This includes initial installation, replacement (one for one with different seats), or relocation of seats or litter systems.  | EVL |
| <b>2</b>  | Changes that affect access and use of emergency exits and passenger door configuration (i.e., emergency medical services, sport parachute jumping).  | ENG |
|           | NOTE: Alterations to an approved aircraft configuration may in themselves not constitute a major design change that would require application for an STC (see 14 CFR part 21, § 21.113). An engineering evaluation of any proposed alteration that will affect the crashworthiness of an aircraft must be conducted prior to determining if a STC is necessary, or if a field approval would be acceptable.<br><br>NOTE: Some seemingly minor changes, such as relocating an existing seat one inch, could have the affect of making an interior |     |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY  
AIRPLANES.**

|  |  |  |
|--|--|--|
|  | <p>non-compliant with the airworthiness requirements. An engineering evaluation must be accomplished that considers all the effects of the proposed alteration. In this example, if the relocation reduced the passageway to an emergency exit to less than the required minimum dimension the change would not be allowed.</p> <p>NOTE: Complete initial interior installations require application for an STC or amended TC.</p> |  |
|--|--|--|

REFERENCE ONLY

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**TRANSPORT CATEGORY AIRPLANES**

**MENU**

The following list applies to airplanes certificated under 14 CFR part 25 (or the earlier regulations).

**Click to select**

REFERENCE ONLY

## AFS-300 MAJOR REPAIR/ALTERATION JOB AID

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
TRANSPORT CATEGORY AIRPLANES**

|   |   |     |
|---|---|-----|
| <p>NOTE: The following list applies to airplanes certificated under 14 CFR Part 25 (or the earlier regulations).</p> <p>NOTE: Refer to Order 8900.1, Volume 4, Chapter 9, Section 1, Paragraph 4-1179 for guidance related to field approvals on aircraft operated under Part 121</p> |   |     |
| <b>A</b>  | <b>Weight and Balance</b>   |     |
| <b>1</b>  | Changes in the certificated CG range limits (for example, decreasing the forward limit or increasing the aft limit).  | STC |
| <b>2</b>  | Changes that increase the operational limits (maximum speed limits such as $V_A$ , $V_C$ , $V_{FE}$ , $V_{NE}$ , $V_{MO}$ , maximum operating limit speed ( $V_{MO}/M_{MO}$ ); minimum speed limitations such as stall speed, increases or reductions in certificated service ceiling; and other performance parameters, as affected).  | STC |
| <b>3</b>  | Changes that increase the certificated maximum weight limits affecting structural, performance, handling qualities, and so forth (for example, increases in the maximum gross weight, maximum takeoff weight, or landing weight).   | STC |
| <b>4</b>  | Changes to unit load devices (ULDs) which incorporate active means to control their internal temperature (i.e., an active ULD (AULD)) or to provide enhanced fire protection features (e.g., through the addition of smoke detectors, active fire suppression, etc.).   | STC |
|   |   |     |
| <b>B</b>  | <b>Structural Strength</b>  |     |
| <b>1</b>  | <p>Changes affecting principal structural elements (PSE) (elements that contribute significantly to the carrying of flight, ground, or pressurization loads, and whose integrity is essential in maintaining the overall structural integrity of the airplane) defined by the current version of AC 25.571-1, Damage Tolerance and Fatigue Evaluation of Structure. A PSE is affected when it is physically altered, is subject to increased loading, or its ability to be inspected is decreased.</p> <p>NOTE: Click INFO icon to view AC 25.571-1</p> | STC |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
TRANSPORT CATEGORY AIRPLANES**

|                  |  |            |
|------------------|--|------------|
| <p><b>2</b></p>  | <p>The <i>following three exceptions</i> are permitted to use data approved by ACO, DER or ODA for alterations that affect a PSE provided that a damage tolerance evaluation is performed and the data is approved to § 25.571 amendment 25-45 or later for the alteration and affected PSE. A PSE is affected when it is physically altered, it is subject to increased loading, or its ability to be inspected is decreased.</p> <p align="center">NOTE: All the following exceptions require damage tolerance approval. DER/ODA approvals for static strength alone are not permissible.</p>  |            |
| <p><b>2a</b></p> | <p><i>Exception 1:</i> Alterations that install “small” equipment mounted externally on the fuselage skin. Structural changes to the fuselage skin such as cutouts with reinforcing-doublers installed to accommodate externally mounted equipment (e.g., small antennas), provided that:</p> <p align="center">1. Compliance with the damage tolerance requirements of § 25.571 at amendment 25-45 or later amendments is demonstrated and approved for the alteration and the affected PSE (e.g., skin, stringers, frames etc.).</p> <p align="center">2. The modification is contained within one frame-stringer bay (area between adjacent frames and adjacent stringers).</p> | <p>ENG</p> |
| <p><b>2b</b></p> | <p><i>Exception 2:</i> Alterations that install mechanisms (e.g., brackets, clips etc.) to support system/wiring installations. Structural changes to bulkheads, floor beams, frames, etc., such as those made to install brackets, clips, or other mechanism to accommodate systems/wiring installations, provided that the compliance with the damage tolerance requirements of § 25.571, amdt 25-45 or later, is demonstrated and approved for the alteration and the affected PSE (e.g., bulkheads, floor beams, frames ect.).</p>   | <p>ENG</p> |
| <p><b>2c</b></p> | <p><i>Exception 3:</i> Alterations that install mechanisms (intercostals, tie rods, links, brackets, clevis lugs, fittings etc.) to support interior component installations. Structural changes to skin, frames, stringers, floor beams, etc., such as those made to install intercostals, tie rods, links, brackets, clevis lugs, fittings etc. to accommodate the installation of interior components (i.e., galleys, closets, lavatories, stowage bins etc.), provided that compliance with the damage tolerance requirements of § 25.571,</p>   | <p>ENG</p> |

## AFS-300 MAJOR REPAIR/ALTERATION JOB AID

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
TRANSPORT CATEGORY AIRPLANES**

|           |   |     |
|-----------|---|-----|
|           | amdt 25-45 or later, is demonstrated and approved for the alteration and the affected PSE (e.g., skin, frames, stringers, floor beams, etc.).   |     |
| <b>3</b>  | Changing the structural panels and load-bearing components that could affect service life.  | STC |
| <b>4</b>  | Changing internal frame, longeron, or structural members.   | STC |
| <b>5</b>  | Changes to PSE to accommodate appliances installed on the exterior of the aircraft (i.e., FLIR equipment or system, cameras, firefighting, agricultural dispensing equipment, etc.). See the current edition of AC 25-7, Flight Test Guide for Certification for Transport Category Airplanes, for guidance for the substantiation of modifications involving installation of external equipment. | STC |
| <b>6</b>  | Changes to landing gear and related system and structural components, including wheels, brakes, and tires.  | STC |
| <b>7</b>  | Substitution of materials for engines, propellers, or primary structures. Per AC 25.1529-1A, “primary structure is structure that significantly contributes to carrying of flight, ground, or pressure loads. It is also known as a structurally significant item (SSI).”   | STC |
| <b>8</b>  | Effects from changes above that affect flutter and vibration for any of the aforementioned changes.   | STC |
| <b>9</b>  | Substitution of blind fasteners in primary structures. Per AC 25.1529-1A, “primary structure is structure that significantly contributes to carrying of flight, ground, or pressure loads. It is also known as a structurally significant item (SSI).”  | ENG |
|           | NOTE: All field approvals for blind fasteners (Cherry Max, or equivalent) in primary structures must be coordinated with the ACO or supported by DER- or ODA-approved data. Per AC 25.1529-1A, “primary structure is structure that significantly contributes to carrying of flight, ground, or pressure loads. It is also known as a structurally significant item (SSI).”                       |     |
| <b>10</b> | Changes of passenger-carrying aircraft to an all-cargo or combined passenger-cargo (“combi”) configuration.   | STC |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
TRANSPORT CATEGORY AIRPLANES**

|           |   |     |
|-----------|---|-----|
|           |   |     |
| <b>C</b>  | <b>Reliability</b>  |     |
| <b>1</b>  | Changes to manifolding, air induction systems or air intake doors, engine cowling, or baffle that affect the flow of engine cooling air.  | STC |
| <b>2</b>  | Changes to the basic engine or propeller design, controls, and operating limitations.   | STC |
| <b>3</b>  | Changes that include engine/propeller adjustments and setting limitations that affect power output.   | STC |
| <b>4</b>  | Modifications to approved avionics equipment that affect functionality, reliability and/or airworthiness, such as:  |     |
| <b>4a</b> | Deviating from the design environment qualifications, or minimum performance standards as specified under TC or amended type certificate (ATC).   | STC |
| <b>4b</b> | Changes to appliances that affect performance, functionality, or configuration that are determined to be major alterations other than those changes mandated by AD, or performed by the design approval holder, which are completed using approved data, that must be documented in the aircraft records. | ENG |
| <b>4c</b> | Deviating from the component manufacturer's specified operating limitations.  | STC |
| <b>4d</b> | Changes to airplane structural, physical, electrical properties, or equipment that could adversely affect RVSM systems and airplane performance.  | ENG |
| <b>4e</b> | Changes to operating system or imbedded software applications. This does not include navigation, terrain, synthetic vision system, and surface navigation/guidance databases.   | STC |
|           |   |     |
| <b>D</b>  | <b>Operational Characteristics</b>  |     |
| <b>1</b>  | Changes or relocation of systems (including hydraulic, oil, and fuel systems) and equipment that affect structural integrity, flight, ground handling characteristics, or noise/acoustics of the aircraft.  | STC |



**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
TRANSPORT CATEGORY AIRPLANES**

|           |  |     |
|-----------|--|-----|
| <b>2</b>  | Significant changes to the movable control surfaces that affect the dynamic and/or static balance, alter the aerodynamic contour of movable control surfaces, or change the weight distribution.   | STC |
| <b>3</b>  | Changes to control surface travel, method of control system mechanical advantage, or direction of motion.  | STC |
| <b>4</b>  | Changes in basic dimensions or external aerodynamic contour/configuration of the aircraft, such as wing and tail planform or incidence angles, canopy, cowlings, contour or radii, the location of wing and tail fairings, winglets, wing lift struts, tiptanks, windows, and doors. | STC |
| <b>5</b>  | Changes in engine cowlings or housings.  | STC |
| <b>6</b>  | Changes to flight-critical electrical/electronic equipment and systems such as electronic flight controls or the engine control system, FADEC, EEC, or fly-by-wire.  | STC |
| <b>7</b>  | Changes that affect aircraft performance, drag, engine power, rpm, or exhaust muffler.   | STC |
| <b>8</b>  | Changes that alter the aerodynamic contour that affect noise or flight characteristics.  | STC |
| <b>9</b>  | Installation of:   |     |
| <b>9a</b> | Avionics systems that perform critical functions, other than installation of basic attitude, altitude, and airspeed instruments, or are highly integrated with complex switching interfaces with other equipment and systems.  | STC |
| <b>9b</b> | Systems that extract power from drive systems, such as the environmental control system (e.g., ventilation, pressurization, temperature control systems, etc).   | STC |
| <b>9c</b> | Health Usage Monitoring Systems (HUMS) or Data Transfer Units (DTU)  | STC |
| <b>9d</b> | Head-up display (HUD), Enhanced Flight Vision Systems (EFVS), or Synthetic Vision Systems (SVS) used for primary navigation.   | STC |
| <b>9e</b> | Traffic collision alerting device (TCAD), traffic advisory systems (TAS), and Traffic Alert and Collision Avoidance  | EVL |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
TRANSPORT CATEGORY AIRPLANES**

|           |  |     |
|-----------|--|-----|
|           | Systems (TCAS ) I. (See InFO 08047)  |     |
| <b>9f</b> | TCAS II  | STC |
| <b>9g</b> | Autopilot, Flight Guidance Systems, and automatic flight control systems (AFCS) or flight directors (FD)   | STC |
| <b>9h</b> | Cockpit voice recorders (CVR) and associated interfaces.   | ENG |
| <b>9i</b> | Flight data recorders (FDR) and associated sensors or digital flight data acquisition unit (DFDAU)   | STC |
| <b>9j</b> | Electronic flight instrument systems (EFIS).   | STC |
| <b>9k</b> | Electronic Horizontal Situation Indicator (EHSI). (See AC 25-11 and InFO 08047.)   | EVL |
| <b>9l</b> | Ground proximity warning systems (GPWS)  | ENG |
| <b>9m</b> | Terrain Avoidance and Warning Systems (TAWS) - A   | ENG |
| <b>9n</b> | TAWS-B. (See AC 25-23 and InFO 08047.)   | ENG |
| <b>9o</b> | Mounting fixtures or brackets and wiring must meet the flammability requirements of §§ 25.853(a) and 25.1713(c).   | ENG |
| <b>9p</b> | Global Positioning System (GPS) or Global Navigation Satellite System (GNSS). (See AC 20-138 and InFO 08047.)<br><br>NOTE: Field approval of coupled Localizer Performance with Vertical guidance (LPV) may be issued for compatible autopilots/flight guidance systems identified by the initial STC holder or the equipment and system manufacturer. | ENG |
| <b>9q</b> | Multi-sensor navigation system (including Navigation Management Systems (NMS) and flight management systems (FMS)). (See AC 20-138 and InFO 08047.)<br><br>NOTE: Field approval of coupled LPV may be issued for compatible autopilots/flight guidance systems identified by the initial STC holder or the equipment and system manufacturer.          | ENG |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
TRANSPORT CATEGORY AIRPLANES**

|           |   |     |
|-----------|---|-----|
| <b>9r</b> | <p>Multifunction Displays (MFD) or Electronic Map Displays (EMD). (See the current edition of AC 25-11.)</p> <p>NOTE: MFD, EMDs, or similar electronic displays are systems that are capable of depicting graphic information (e.g., engine instrumentation, TAS, TCAS, TAWS, terrain, moving map, weather detection, weather radar, windshear, etc.) from multiple sensors that have been demonstrated to meet applicable minimum performance standards or that are produced under a TSOA. When used to display primary flight information to meet regulatory operating requirements, the manufacturer or installer also must ensure that such information, as it is scheduled to be depicted, is prioritized as to its importance in critical flight phases so that, for example, TAWS or terrain contours and/or alerts are depicted near terrain or obstructions; windshear alerts are depicted on approach or departures to airports below 900 feet AGL; or weather radar is displayed, unless overridden by TAS or TCAS, in environments with threatening proximate traffic, etc.</p> | ENG |
| <b>9s</b> | <p>Electronic Flight Bag (EFB) Class 1 and Class 2 Mounting devices, data connectivity, and aircraft power connections. See AC 120-76.</p> <p>NOTE: Class 1 and Class 2 EFB units themselves are considered to be portable electronic devices (PED) and do not require installation approval.</p>   | ENG |
| <b>9t</b> | <p>EFB Class 3 employing Type A, B, and/or C software applications. (See AC 120-76 and FAA Order 8900.1 for instructions.)</p>  | STC |
| <b>9u</b> | <p>Emergency Vision Assurance System (EVAS)</p>   | STC |
| <b>9v</b> | <p>Night vision goggles (NVG) environments including existing lighting and Night Vision Imaging System (NVIS) arrays.</p>   | STC |
| <b>9w</b> | <p>Forward Looking Infrared (FLIR), Light Detection and Ranging (LIDAR), or airborne surveillance systems incorporating visible and non-visible laser pointer, range finder, and laser illumination devices (Class IIIb and Class IV as rated by the Food and Drug Administration (FDA)).</p>   | STC |
| <b>9x</b> | <p>High-Intensity Discharge (HID) lamps and power supplies must have been issued an STC for a particular make and model airplane and PMA supplement lists specific eligibility for installation of HID as supplemental lighting only.</p>   | ENG |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
TRANSPORT CATEGORY AIRPLANES**

|            |  |     |
|------------|--|-----|
| <b>9y</b>  | HID lighting installed and intended for use as primary lighting required to meet performance under the airworthiness standards requires approval by STC.   | STC |
| <b>9z</b>  | Anti-terrorism countermeasures, including flares and dispensing systems.   | STC |
| <b>9aa</b> | Automatic Dependent Surveillance - Broadcast (ADS-B)   | STC |
| <b>9bb</b> | Electrical generation and distribution components.   | STC |
| <b>10</b>  | Any alteration that requires flight testing to show compliance with the regulations (not applicable to operational flights following maintenance and alterations conducted under § 91.407(b)).   | ENG |
| <b>11</b>  | Changes that result in an increase in maximum flight distance (e.g. ETOPs). These changes may require a determination to ensure that the approved Class C cargo compartment fire suppression system affords an adequate level of safety (i.e. duration of fire suppression). | STC |
| <b>E</b>   | <b>Changes to Systems that Affect Aircraft Airworthiness, Such as:</b>   |     |
| <b>1</b>   | Changes to landing gear and related components, such as internal parts of shock struts, length, geometry of members, brake and brake systems, or additions.  | STC |
| <b>2</b>   | Changes to an existing or installation of a new icing protection system.   | STC |
| <b>3</b>   | Changes to or relocation of exterior fuel vents, fuel drains, or battery vents. (Applicable to components not attached to the basic engine.)   | STC |
| <b>4</b>   | Changes to crew or passenger LOX or onboard generating systems.  | ENG |
| <b>5</b>   | Changes to external, critical access doors, APU ram air, nacelle blowout doors, fuel drain.  | ENG |
| <b>6</b>   | Changes that include substituting engine/propeller/airframe materials that affect structural integrity, lightning protection, or flight characteristics.   | ENG |
| <b>7</b>   | Changes to a critical or life-limited part, including engine/APU rotating parts.   | STC |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
TRANSPORT CATEGORY AIRPLANES**

|           |   |     |
|-----------|---|-----|
| <b>8</b>  | Changes that may require a showing of compliance for human factors requirements (for example, in flight deck instrumentation and controls).   | STC |
| <b>9</b>  | Changing or substituting engine/aircraft instrumentation required by a unique characteristic of the particular type design.   | STC |
| <b>10</b> | Modification (addition or relocation) of wire, electrical cables, or other electrical wiring interconnection system (EWIS) components on airplanes that have CFR part 25 subpart H in their type certification basis (i.e., 25.17XX).   | STC |
| <b>11</b> | <p>Addition of systems equipment that may impact flutter or couple with vibrations.</p> <p>For example, the addition of a light on the tip of a winglet can result in flutter. The addition of sensors or an avionic sensor box may cause erroneous commands to control surfaces. Airplane vibration may cause failure of mounting (and other damage) of equipment offset from structure.</p> <p>NOTE: On jet equipped airplanes, a blade-out failure can result in additional failures through this phenomena.</p> | STC |
| <b>12</b> | Changes that do not conform to the minimum standards in a TSO under which a particular component or appliance is manufactured (See InFO 08047).   | STC |
| <b>13</b> | Altering wiring, shielding, or bonding that may adversely affect protection against HIRF, EMI, lightning diversion or suppression.  | STC |
| <b>F</b>  | <b>Changes to Oil, Hydraulic, Pneumatic, and Fuel Lines, or Systems or Their Components That Affect Their Operation or Installation and Flammability Requirements, Such as:</b>   |     |
| <b>1</b>  | New types of hoses and/or hose fittings that may not meet installation requirements, such as those of flow rate and flammability.   | ENG |
| <b>2</b>  | New type of fuel dump valves.   | ENG |
| <b>3</b>  | New oil/fuel/hydraulic line materials.  | ENG |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
TRANSPORT CATEGORY AIRPLANES**

|          |   |     |
|----------|---|-----|
| <b>4</b> | New fuel tanks or fuel system components, including sealants.   | STC |
|          |   |     |
| <b>G</b> | <b>Changes in Fixed Fire Extinguisher or Detector Systems That Affect the System's Effectiveness or Reliability, Such as:</b>   |     |
| <b>1</b> | Relocating discharge nozzle, detector units, or fixed fire extinguisher bottles.  | ENG |
| <b>2</b> | Using new or different detectors.   | ENG |
| <b>3</b> | Decreasing the amount or changing the type of extinguishing agents used in any application (i.e., hand-held fire extinguishing bottles, trash receptacle and engine/APU fire extinguishing systems and cargo compartment fire suppression systems). | ENG |
|          |   |     |
| <b>H</b> | <b>Alterations or Repairs That Include:</b>   |     |
| <b>1</b> | Changes that include substituting airframe materials that affect structural integrity, lightning protection, HIRF protection, flight characteristics or performance.  | ENG |
| <b>2</b> | Use of synthetic covering materials.  | ENG |
| <b>3</b> | Use of new titanium or magnesium applications.  | ENG |
| <b>4</b> | Use of ceramic coatings.  | ENG |
| <b>5</b> | Use of synthetic coatings.  | ENG |
| <b>6</b> | Use of new plated coatings.   | ENG |
|          |   |     |
| <b>I</b> | <b>Crashworthiness</b>  |     |
| <b>1</b> | Changes to the aircraft structure, cabin interiors, seating configurations, or equipment relocation that affect crashworthiness and/or emergency evacuation. This includes  | ENG |

## AFS-300 MAJOR REPAIR/ALTERATION JOB AID

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
TRANSPORT CATEGORY AIRPLANES**

|          |   |     |
|----------|---|-----|
|          | initial installation, replacement (one for one with different seats), or relocation of seats or litter systems.   |     |
| <b>2</b> | Changes that affect access and use of emergency exits and passenger door configurations (e.g., emergency medical services, sport parachute jumping).  | ENG |
|          | <p>NOTE: Alterations to an approved aircraft configuration may in themselves not constitute a major design change that would require application for an STC (see § 21.113). An engineering evaluation of any proposed alteration that will affect the crashworthiness of an aircraft must be conducted prior to determining if a STC is necessary, or if a field approval would be acceptable.</p> <p>NOTE: Some seemingly minor changes, such as relocating an existing seat one inch, could have the affect of making an interior non-compliant with the airworthiness requirements. An engineering evaluation must be accomplished that considers all the effects of the proposed alteration. In this example, if the relocation reduced the passageway to an emergency exit to less than the required minimum dimension the change would not be allowed.</p> <p>NOTE: Complete initial interior installations require application for an STC or amended TC.</p> |     |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**NORMAL AND TRANSPORT CATEGORY ROTORCRAFT**

**MENU**

The following section applies to aircraft with a certification basis of 14 CFR parts 27, 29, or the earlier regulations.

**Click to select**

REFERENCE ONLY



## AFS-300 MAJOR REPAIR/ALTERATION JOB AID

### Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1 NORMAL AND TRANSPORT CATEGORY ROTORCRAFT

|  |   |     |
|--|---|-----|
| NOTE: The following section applies to aircraft with a certification basis of 14 CFR parts 27, 29, or the earlier regulations. |   |     |
| <b>A</b>   | <b>Weight &amp; Balance</b>   |     |
| <b>1</b>   | Changes that increase the certificated maximum weight limits affecting structural, performance, handling qualities, and so forth (for example, increases in the maximum gross weight, maximum takeoff weight, or landing weight).   | STC |
| <b>2</b>   | Changes in the certificated CG range limits (for example, decreasing the forward limit or increasing the aft limit).  | STC |
| <b>3</b>   | Changes that increase the operational limits (maximum speed limits such as $V_A$ , $V_{FE}$ , $V_{NE}$ ; minimum speed limitations; increases or reductions in certificated service ceiling; and other performance parameters, as affected).  | STC |
|  |   |     |
| <b>B</b>   | <b>Structural Strength</b>  |     |
| <b>1</b>   | Changing primary structural elements/ principal structural elements (PSE) that carry flight, ground, or pressure loads, defined by the current edition of AC 27-1 or AC 29-2, section 571, Damage Tolerance and Fatigue Evaluation of Structure.  | STC |
| <b>1a</b>  | Changing the structural panels and load-bearing components that could affect service life.  | STC |
| <b>1b</b>  | Changing internal frame, longeron, or structural members.   | STC |
| <b>1c</b>  | Changes to significant structure to accommodate appliances installed on the exterior of the aircraft (i.e., FLIR equipment or system, cameras, firefighting, agricultural dispensing equipment, etc.). (See the current editions of AC 27-1, Certification of Normal Category Rotorcraft, and AC 29-2, Certification of Transport Category Rotorcraft, for guidance for the substantiation of modifications involving installation of dispensing and other external equipment.) | STC |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
NORMAL AND TRANSPORT CATEGORY ROTORCRAFT**

|           |  |     |
|-----------|--|-----|
| <b>1d</b> | Changes to landing gear and related systems including internal parts of shock struts, length, and geometry of members and structural components.                                 | STC |
| <b>1e</b> | Changes to wheels, brakes, and tires.  | ENG |
| <b>1f</b> | Substituting engine, rotor, or airframe primary structure materials.   | STC |
| <b>2</b>  | Effects from changes above that affect flutter and vibration for any of the aforementioned changes.  | STC |
| <b>3</b>  | Substituting blind fasteners in primary load structures.   | ENG |
|           | NOTE: All field approvals for blind fasteners (Cherry Max, or equivalent) in primary load structures must be coordinated with the ACO or supported by DER or ODA approved data.  |     |
|           |  |     |
| <b>C</b>  | <b>Reliability</b>   |     |
| <b>1</b>  | Changes to manifolding, air induction systems or air intake doors, engine cowling, or baffle that affect the flow of engine cooling air and carburetor/fire ignition heat rises. | STC |
| <b>2</b>  | Change to the basic engine, or rotor design, controls, or operating limitations.   | STC |
| <b>3</b>  | Changes that include engine/rotor adjustments and setting limitations that affect power output.  | STC |
| <b>4</b>  | Modifications to approved avionics equipment that affect functionality, reliability and/or airworthiness, such as:   |     |
| <b>4a</b> | Deviating from the design environment qualifications, or minimum performance standards as specified under TC or amended type certificate (ATC).                                  | STC |
| <b>4b</b> | Changes to appliances, other than those specified and approved by FAA mandatory action, which affects performance, functionality, or configuration that are                      | ENG |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
NORMAL AND TRANSPORT CATEGORY ROTORCRAFT**

|           |   |     |
|-----------|---|-----|
|           | determined to be major alterations or performed by the design approval holder, which are completed using approved data, that must be documented in the aircraft records.  |     |
| <b>4c</b> | Deviating from the component manufacturer's specified operating limitations.  | STC |
| <b>4d</b> | Changes to operating system or imbedded software applications. This does not include navigation, terrain, and synthetic vision systems and surface navigation/guidance databases.   | STC |
| <b>4e</b> | Altering wiring, shielding, or bonding that may adversely affect protection against HIRF and EMI or lighting diversion or suppression.  | ENG |
|           |   |     |
| <b>D</b>  | <b>Operational Characteristics</b>  |     |
| <b>1</b>  | Changes or relocation of systems (including hydraulic, oil, and fuel systems) and equipment that affect structural integrity, flight, ground handling characteristics, or noise/acoustics of the aircraft.  | STC |
| <b>2</b>  | Changes that alter the movable control surfaces that affect the dynamic and/or static balance, alter the aerodynamic contour of movable control surfaces, or change the weight distribution.  | STC |
| <b>3</b>  | Changes in control surface travel, control system mechanical advantage, location of control system component parts, or direction of motion.   | STC |
| <b>4</b>  | Changes in basic dimensions or external aerodynamic contour/configuration of the aircraft such as wing and tail planform or incidence angles, canopy, cowlings, contour or radii, the location of wing and tail fairings, winglets, wing lift struts, and tiptanks. | STC |
| <b>5</b>  | Changes in canopies, windows, and doors, including installation of bubble or extended observation windows.  | STC |
| <b>6</b>  | Changes in engine cowlings or housings.   | STC |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
NORMAL AND TRANSPORT CATEGORY ROTORCRAFT**

|            |   |     |
|------------|---|-----|
| <b>7</b>   | Changes to flight-critical electrical/electronic equipment and systems such as electronic flight controls or the engine control system, FADEC, EEC, or fly-by-wire.   | STC |
| <b>8</b>   | Changes that affect aircraft performance, drag, engine power, rpm, or exhaust muffler.  | ENG |
| <b>9</b>   | Changes that alter the aerodynamic contour that affect noise or flight characteristics.   | ENG |
|            |   |     |
| <b>10</b>  | Installation of:  |     |
| <b>10a</b> | Avionics systems that perform critical functions, other than installation of basic attitude, altitude, and airspeed instruments, or are highly integrated with complex switching interfaces with other equipment and systems.   | STC |
| <b>10b</b> | Avionics systems installed under an AML STC that do not conform to the type design established at the time of certification or which require assessment caused by a deviation in location of ancillary components or equipment. | ENG |
| <b>10c</b> | Systems that extract power from drive systems, such as air conditioning power drawn from the tail rotor driveshaft.   | STC |
| <b>10d</b> | Health Usage Monitoring Systems (HUMS) or Data Transfer Units (DTU)   | STC |
| <b>10e</b> | Head-up display (HUD), enhanced flight vision systems (EFVS), or Synthetic Vision Systems (SVS) used for primary navigation   | STC |
| <b>10f</b> | Traffic collision alerting device (TCAD), traffic advisory systems (TAS), Traffic Alert and Traffic Alert and Collision Avoidance System I (TCAS I) (See InFO 08047 for reference to FSAW 98-04D.)                              | EVL |
| <b>10g</b> | TCAS II.  | STC |

## AFS-300 MAJOR REPAIR/ALTERATION JOB AID

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
NORMAL AND TRANSPORT CATEGORY ROTORCRAFT**

|            |  |     |
|------------|--|-----|
| <b>10h</b> | Autopilot, Flight Guidance Systems, and automatic flight control system (AFCS) or flight directors (FD).   | STC |
| <b>10i</b> | Cockpit voice recorders (CVR) and associated interfaces.   | EVL |
| <b>10j</b> | Flight data recorders (FDR) and associated sensors or digital flight data acquisition unit (DFDAU).  | STC |
| <b>10k</b> | Electronic flight instrument systems (EFIS).   | STC |
| <b>10l</b> | Electronic horizontal-situation indicators (EHSI). (See the current editions of AC 27-1 and AC 29-2) See InFO 08047 for reference to FSAW 05-09E.  | EVL |
| <b>10m</b> | Terrain advisory systems (non-TSO-194 systems) that are not "HTAWS".<br><br>NOTE: Contact the Rotorcraft Directorate for clarification of this determination.  | EVL |
| <b>10n</b> | TAWS-HTAWS meeting TSO-C194 requirements.<br><br>NOTE: The Rotorcraft Directorate has determined that installation of TAWS-HTAWS meeting TSO-C194 has an appreciable effect on the airworthiness of rotorcraft and must be accomplished via STC. Contact the Rotorcraft Directorate for clarification of this determination. For requests to reclassify, follow the procedure provided in this job aid.                  | STC |
| <b>10o</b> | Mounting fixtures or brackets for portable devices such as Global Positioning System (GPS) or Electronic Flight Bag (EFB) must be flame-resistant in compliance with the requirements of 14 CFR part 27, § 27.853(a) or the requirements of 14 CFR part 29, §29.853 and wiring as installed meets the requirements of § 27.1365 or § 29.1359 and has passed the flammability tests of part 25 appendix F, part I (a)(3). | ENG |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
NORMAL AND TRANSPORT CATEGORY ROTORCRAFT**

|               |   |                     |
|---------------|---|---------------------|
| <b>10p</b>    | GPS or GNSS, <u>without</u> coupled LPV.<br><br>(See AC 20-138 and InFO 08047)  | ENG                 |
| <b>10p(1)</b> | GPS or GNSS, <u>with</u> coupled LPV.<br>(See AC 20-138 and InFO 08047)<br><br>NOTE:<br>Coupled LPV for rotorcraft must consider performance of the navigation/autopilot systems as installed in the particular aircraft. Navigation/autopilot/aircraft interaction is particularly important for slow speed, high angle, Point in Space (PinS) approaches. Contact the Rotorcraft Directorate Standards Staff for guidance.<br><br>(See AC 20-138 and InFO 08047.)   | Consult Directorate |
| <b>10q</b>    | Multi-sensor Navigation System (including NMS and FMS), <u>without</u> coupled LPV.<br><br>(See AC 20-138 and InFO 08047)   | ENG                 |
| <b>10q(1)</b> | Multi-sensor Navigation System (including NMS and FMS), <u>with</u> coupled LPV. (See AC 20-138 and InFO 08047.)<br><br>NOTE:<br>Coupled LPV for rotorcraft must consider performance of the navigation/autopilot systems as installed in the particular aircraft. Navigation/autopilot/aircraft interaction is particularly important for slow speed, high angle, Point in Space (PinS) approaches. Contact the Rotorcraft Directorate Standards Staff for guidance.<br><br>(See AC 20-138 and InFO 08047) | Consult Directorate |
| <b>10r</b>    | MFD or EMDs used as primary displays for required instruments (See AC 27-1 and AC 29-2.)  | STC                 |
| <b>10s</b>    | Multifunction displays (MFD) or Electronic Map Displays (EMD) (See AC 23.1311-1 and AC 25-11.)<br><br>NOTE: MFD, EMDs, or similar electronic displays are systems that are capable of depicting graphic information (e.g., engine instrumentation, TAS, TCAS, TAWS, terrain, moving map, weather detection, weather radar, windshear,   | ENG                 |

## AFS-300 MAJOR REPAIR/ALTERATION JOB AID

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
NORMAL AND TRANSPORT CATEGORY ROTORCRAFT**

|            |   |     |
|------------|---|-----|
|            | etc.) from multiple sensors that have been demonstrated to meet applicable minimum performance standards or are produced under TSOA. When used to display primary flight information to meet regulatory operating requirements, the manufacturer or installer must ensure that such information, as it is scheduled to be depicted, is prioritized as to its importance in critical flight phases so that, for example, TAWS or terrain contours and/or alerts are depicted near terrain or obstructions, windshear alerts are depicted on approach or departures to airports below 900 feet AGL, or weather radar is displayed (unless overridden by TAS or TCAS) in environments with threatening proximate traffic, etc. environments with threatening proximate traffic, etc. |     |
| <b>10t</b> | Electronic Flight Bag (EFB) Class 1 and Class 2 mounting devices, data connectivity and aircraft power connections. See AC 120-76.<br>NOTE: Class 1 and Class 2 EFB units themselves are considered to be PEDs and do not require installation approval.  | ENG |
| <b>10u</b> | EFB Class 3 employing Type A, B and/or C software applications. (See the current edition of AC 120-76 and FAA Order 8900.1 for instructions.)   | STC |
| <b>10v</b> | Emergency Vision Assurance System (EVAS).   | STC |
| <b>10w</b> | Night vision goggles (NVG) environments including existing lighting and Night Vision Imaging System (NVIS) arrays   | STC |
| <b>10x</b> | Forward Looking Infrared (FLIR), Light Detection and Ranging (LIDAR), or airborne surveillance systems incorporating visible and non-visible laser pointer, range finder, and laser illumination devices (Class IIIb and Class IV, as rated by the Food and Drug Administration (FDA)).   | STC |
| <b>10y</b> | High-Intensity Discharge (HID) lamps and power supplies must have been issued STC for a particular make and model airplane and PMA supplement lists specific eligibility for installation of HID as supplemental lighting only.   | ENG |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
NORMAL AND TRANSPORT CATEGORY ROTORCRAFT**

|             |   |     |
|-------------|---|-----|
| <b>10z</b>  | HID lighting installed and intended for use as primary lighting required to meet performance under the airworthiness standards requires approval by STC.  | STC |
| <b>10aa</b> | Anti-terrorism countermeasures, including flares and dispensing systems.  | STC |
| <b>10bb</b> | Automatic Dependent Surveillance-Broadcast (ADS-B).   | STC |
| <b>11</b>   | Any alteration that requires flight testing to show compliance with the regulations (not applicable to operational flights following maintenance and alterations conducted under § 91.407(b)).  | ENG |
|             |   |     |
| <b>E</b>    | <b>Changes to systems that affect aircraft airworthiness, such as:</b>  |     |
| <b>1</b>    | Changes to an existing or installation of a new icing protection system.  | STC |
| <b>2</b>    | Changes to or relocation of exterior fuel vents, fuel drains, or battery vents. (Applicable to components not attached to the basic engine.)  | ENG |
| <b>3</b>    | Changes to crew or passenger LOX or onboard generating systems.   | ENG |
| <b>4</b>    | Changes to external, critical access doors, APU ram air, nacelle blowout doors, fuel drain.   | ENG |
| <b>5</b>    | Changes that include substituting rotor/airframe materials that affect structural integrity, lightning protection, or flight characteristics.   | ENG |
| <b>6</b>    | Changes that alter dynamic components of rotorcraft, such as loads, vibration, fatigue, damage tolerance, flaw tolerance, characteristics of main or tail rotor system, transmission system, gearbox, driveshafts, driveshaft support bearings, and main and tail rotor blades. | STC |



**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
NORMAL AND TRANSPORT CATEGORY ROTORCRAFT**

|           |   |     |
|-----------|---|-----|
| <b>7</b>  | Changes to a critical or life-limited part, including engine/APU rotating parts.  | STC |
| <b>8</b>  | Changes of passenger-carrying aircraft to an all-cargo or combination configuration.  | STC |
| <b>9</b>  | Changes that may require a human factors compliance finding (for example, in flight deck instrumentation and controls).   | STC |
| <b>10</b> | Changing or substituting engine/aircraft instrumentation required by a unique characteristic of the particular type design.   | STC |
| <b>11</b> | Changes to rpm of main and tail rotor may affect handling performance characteristics and/or noise or acoustics.  | STC |
|           |   |     |
| <b>F</b>  | <b>Changes to Oil, Hydraulic, Pneumatic, and Fuel Lines, or Systems or Their Components That Affect Their Operation or Installation and Flammability Requirements, Such as:</b> |     |
| <b>1</b>  | New types of hoses and/or hose fittings that may not meet installation requirements, such as those of flow rate and flammability.   | ENG |
| <b>2</b>  | New type of fuel dump valves.   | ENG |
| <b>3</b>  | New oil/fuel/hydraulic line materials.  | ENG |
| <b>4</b>  | New fuel tanks or fuel system components, including sealants.   | STC |
|           |   |     |
| <b>G</b>  | <b>Changes in Fixed Fire Extinguisher or Detector Systems That Affect the System's Effectiveness or Reliability, Such as:</b>   |     |
| <b>1</b>  | Relocating discharge nozzle, detector units, or fixed fire extinguisher bottles.  | ENG |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
NORMAL AND TRANSPORT CATEGORY ROTORCRAFT**

|          |   |     |
|----------|---|-----|
| <b>2</b> | Using new or different detectors.   | ENG |
| <b>3</b> | Decreasing the amount or changing the type of extinguishing agents.   | ENG |
|          |   |     |
| <b>H</b> | <b>Alterations or Repairs That Include:</b>   |     |
| <b>1</b> | Changes that include substituting airframe materials that affect structural integrity, lightning protection, HIRF protection, flight characteristics, or performance.   | ENG |
| <b>2</b> | Use of synthetic covering materials.  | ENG |
| <b>3</b> | Use of new titanium or magnesium applications.  | ENG |
| <b>4</b> | Use of ceramic coatings.  | ENG |
| <b>5</b> | Use of synthetic coatings.  | ENG |
| <b>6</b> | Use of new plated coatings.   | ENG |
|          |   |     |
| <b>I</b> | <b>Crashworthiness.</b>   |     |
| <b>1</b> | Changes to the aircraft structure, cabin interiors, seating configurations, or equipment relocation that affect crashworthiness and/or emergency evacuation. This includes initial installation, replacement (one for one with different seats), or relocation of seats or litter systems.  | STC |
| <b>2</b> | Changes that affect access and use of emergency exits and passenger door configurations (e.g., emergency medical services, sport parachute jumping).  | STC |
|          | NOTE: Alterations to an approved aircraft configuration may in themselves not constitute a major design change that would require application for an STC (see § 21.113). An engineering evaluation of any proposed alteration that will affect the crashworthiness of an aircraft must be conducted prior to determining if a STC is necessary, or if a field approval would be acceptable. |     |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
NORMAL AND TRANSPORT CATEGORY ROTORCRAFT**

|  |  |  |
|--|--|--|
|  | <p>NOTE: Some seemingly minor changes, such as relocating an existing seat one inch, could have the affect of making an interior non-compliant with the airworthiness requirements. An engineering evaluation must be accomplished that considers all the effects of the proposed alteration. In this example, if the relocation reduced the passageway to an emergency exit to less than the required minimum dimension the change would not be allowed.</p> <p>NOTE: Complete initial interior installations require application for an STC or amended TC.</p> |  |
|--|--|--|

REFERENCE ONLY

# AFS-300 MAJOR REPAIR/ALTERATION JOB AID

## ENGINES, PROPELLERS, AND APU

### MENU

The following list applies to engines certificated under 14 CFR parts 33, 34, and 36 or JAR E, propellers certificated under 14 CFR part 35 or JAR P, or APUs approved under TSO C77a or TSO C77b.

**Click to select**

REFERENCE ONLY

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
ENGINES, PROPELLERS, AND APU**

|  |   |     |
|--|---|-----|
| NOTE: The following list applies to engines certificated under 14 CFR parts 33, 34, and 36 or JAR E, propellers certificated under 14 CFR part 35 or JAR P, or APUs approved under TSO-C77a or TSO-C77b. |   |     |
| <b>A</b>   | <b>Weight and Balance (W&amp;B)</b>   |     |
| <b>1</b>   | Changes that increase or decrease the certificated weight or CG.  | STC |
|  |   |     |
| <b>B</b>   | <b>Structural Strength</b>  |     |
| <b>1</b>   | Major type design changes to an engine, APU, or propeller's primary or critical structure.  | STC |
|  |   |     |
| <b>C</b>   | <b>Reliability and Airworthiness</b>  |     |
| <b>1</b>   | Changes to the approved ratings or operational or installation limits.  | STC |
| <b>2</b>   | Changes to the engine, propeller, or APU control system.  | STC |
| <b>3</b>   | Changes to engine, propeller, or APU adjustments and setting limitations that have an affect on power output or control functions or operability. | STC |
| <b>4</b>   | Changes that alter the aerodynamic contour of any blades, vanes, or internal or external aerodynamic surfaces.                                    | STC |
| <b>5</b>   | Changes affecting engine or propeller performance, power, or rpm, including changes to inlet induction or exhaust components.                     | STC |
|  |   |     |
| <b>D</b>   | <b>Changes to Components, Assemblies, or Systems, Such as:</b>  |     |
| <b>1</b>   | Relocation of fuel vents or drains.   | STC |
| <b>2</b>   | Adding new or using different type design alternators, generators, starters, vacuum pumps, or magnetos.   | ENG |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
ENGINES, PROPELLERS, AND APU**

|           |  |     |
|-----------|--|-----|
| <b>3</b>  | Adding new or using different type design hydraulic components, pumps, or turbo or superchargers.  | ENG |
| <b>4</b>  | Changing or relocating pressure fuel lines, oil lines and bleed-air lines.   | ENG |
| <b>5</b>  | External critical access doors, APU ram air, nacelle blowout doors, bleed ports and doors, and so forth.   | STC |
| <b>6</b>  | Installing new or modifying existing icing protection systems.   | STC |
| <b>7</b>  | Changes that include substituting engine/APU/propeller materials that affect structural integrity, lightning protection, operating characteristics, fire protection, or noise/acoustics. | STC |
| <b>8</b>  | Major alterations to propellers.   | STC |
| <b>9</b>  | Changes to critical or life-limited parts.   | STC |
| <b>10</b> | New propeller and engine combinations (vibration approval).  | STC |
|           |  |     |
| <b>E</b>  | <b>Modification to Approved Electrical Equipment, Such as:</b>   |     |
| <b>1</b>  | To design environmental performance standards.   | STC |
| <b>2</b>  | To the component manufacturer's specified operating limitations.   | STC |
| <b>3</b>  | Altering wiring, shielding or bonding that may adversely affect protection against HIRF, EMI, lightning diversion, or suppression.   | STC |
| <b>4</b>  | Changing or altering flight-critical electrical/electronic systems, such as electronic controls or engine, propeller, or APU control systems such as FADEC or EEC.                       | STC |
| <b>5</b>  | Changing or altering engine, propeller, or APU instrumentation.  | ENG |
| <b>6</b>  | Changes that do not conform to the minimum standards in a TSO under which a particular component or appliance is manufactured (see InFO 08047).  | EVL |
|           |  |     |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID**

**Figure 4-68 Order 8900.1 Volume 4, Chapter 9, Section 1  
ENGINES, PROPELLERS, AND APU**

|          |  |     |
|----------|--|-----|
| <b>7</b> | Changes to or relocation of any systems (including hydraulic, oil, and fuel systems) and equipment that affect structural integrity, operating characteristics, noise/acoustics, fire protection, or emissions and fuel venting. | STC |
| <b>8</b> | Changes affecting the Airworthiness Limitations section (i.e., Chapter 4 or 5) of the ICAs.  | STC |
|          |  |     |
| <b>F</b> | <b>Other Considerations</b>  |     |
| <b>1</b> | Changes affecting exhaust emissions (part 34).   | STC |
| <b>2</b> | Changes affecting engine noise (part 36).  | STC |

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID  
LINKS TO SPECIFIC SYSTEM GUIDANCE AND INFORMATION**

\*\*\*\*\*

**NOTE: This menu is not 'c'p'c'm/penwukg'ku'q'c'r r dcedig'i wlf cpeg0'  
Vj g'c'r r dcedig'i wlf cpeg'ku'f gygt o lpgf 'dcugf 'qp'vj g'r ct vlewrtu'q'q'gej 'tgr ckt 'qt 'cngt cvkqp0'**  
\*\*\*\*\*

REFERENCE ONLY



**AFS-300 MAJOR REPAIR/ALTERATION JOB AID  
SPECIFIC SYSTEM GUIDANCE OVERVIEW**

**ELECTRONIC HORIZONTAL SITUATION INDICATOR**

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**NOTE: This is not an all-inclusive list of applicable guidance.**

\*\*\*\*\*

FAA Order 8900.1, effective 09/03/2007 cancelled FAA Order 8300.10, Airworthiness Inspector's Handbook. At the time Order 8300.10 was cancelled, its appendix contained certain Flight Standards Information Bulletins for Airworthiness (FSAW) that were the sole source of historical information, certain technical information, and authorization for inspectors to perform approvals of Flight Manual Supplements or Supplemental Flight Manuals. To preserve the policies and practices described in selected FSAWs InFO 08047 was issued. This InFO states that the following FSAW's expiration dates are considered to be NONE and that they will not expire until they have been incorporated into FSIMS, superseded by another bulletin or order, or cancelled: FSAW 94-32C, FSAW 94-41, FSAW 95-09E, FSAW 97-09, FSAW 98-04D and FSAW 02-03A. A synopsis of the FSAW content applicable to your search is provided below.

**InFO 08047**

**Overview**

- Clarifies procedures for field approval of Electronic Horizontal Situation Indicator (EHSI) installations.
- Makes the distinction between Electronic Flight Instrumentation System (EFIS) and EHSI.
- Names the specific EHSI makes and models that may be field approved
- Lists the conditions and limitations under which the approval may be granted
- Identifies deviations that would require ACO coordination
- Grants the Avionics inspector the authority to review and approve AFMS or RFMS based on the content of the original supplement.

**FSAW 95-09E**

**Electronic Horizontal Situation Indicator (EHSI) Approvals**

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID  
SPECIFIC SYSTEM GUIDANCE**

**NIGHT VISION IMAGING SYSTEMS / NIGHT VISION GOGGLES**

\*\*\*\*\*

**NOTE: The links in this menu are provided here for convenience. This menu is not an all-inclusive list of applicable guidance. Applicable guidance is determined by the particulars of each repair or alteration.**

\*\*\*\*\*

Field approvals are not authorized for Night Vision Imaging System (NVIS) / Night Vision Goggle (NVG) aircraft modifications. NVIS / NVG for all aircraft categories may be approved through STC only.

This limitation is necessary due to the complexity of factors introduced by NVIS modification such as cockpit obstructions, inability of pilots to move their heads while wearing NVG, the inability of the cockpit to accommodate a pilot wearing a helmet, lighting compatibility and others.

NVIS does not include other night or low visual environment enhancement devices such as Forward Looking Infrared (FLIR) or Enhanced Vision Systems (EVS)

The following links provide NVIS/NVG information:

Aircraft Certification Service  
Night Vision Imaging System (NVIS) / Night Vision Goggles (NVG)

FAASTeam Night Vision Goggles (NVG) Course

Order 8900.1, Volume 4, Chapter 7, Section 4  
Night Vision Imaging Systems

Order 8900.1, Volume 6, Chapter 11, Section 22  
Conduct Night Vision Imaging System Evaluation Inspection

TSO-C164 Night Vision Goggles

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID  
SPECIFIC SYSTEM GUIDANCE OVERVIEW**

**SATELLITE NAVIGATION SYSTEMS**

\*\*\*\*\*

**NOTE: This is not an all-inclusive list of applicable guidance.**

\*\*\*\*\*

FAA Order 8900.1, effective 09/03/2007 cancelled FAA Order 8300.10, Airworthiness Inspector's Handbook. At the time Order 8300.10 was cancelled, its appendix contained certain Flight Standards Information Bulletins for Airworthiness (FSAW) that were the sole source of historical information, certain technical information, and authorization for inspectors to perform approvals of Flight Manual Supplements or Supplemental Flight Manuals. To preserve the policies and practices described in selected FSAWs InFO 08047 was issued. This InFO states that the following FSAW's expiration dates are considered to be NONE and that they will not expire until they have been incorporated into FSIMS, superseded by another bulletin or order, or cancelled: FSAW 94-32C, FSAW 94-41, FSAW 95-09E, FSAW 97-09, FSAW 98-04D and FSAW 02-03A. A synopsis of the FSAW content applicable to your search is provided below.

**InFO 08047**

**Overview**

- Provide guidance for the performance of field approvals of the installation and operational use of global positioning systems (GPS) or GPS with wide area augmentation system (GPS/WAAS) equipment.
- Outline responsibilities in substantiating alterations and approvals
- Discuss the use of STC or TC data
- Describe the conditions under which the alteration may be classified as minor
- Provide guidance for test and evaluation of an installation
- Address various other installation and operational approval considerations
- Grant ASI authority to review and approve an AFMS/RFMS for operational use of GPS or GPS-WAAS equipment, based on an original AFMS/RFMS approved by the FAA for an initial TC or one aircraft or multiple STC.

**FSAW 94-32C**

**Field Approval of the Installation and Operational Use of Global Positioning Systems (GPS) or GPS with Wide Area Augmentation Systems (GPS-WAAS)  
Referred to as Global Navigation Satellite Systems (GNSS) Equipment**

**FSAW 94-41**

**Global Positioning System/Differential Global Positioning System - Special Use Applications**

Continued on next page

**AFS-300 MAJOR REPAIR/ALTERATION JOB AID  
SPECIFIC SYSTEM GUIDANCE OVERVIEW**

**SATELLITE NAVIGATION SYSTEMS**

**FSAW 97-09**

**Global Positioning Systems (GPS) Localizer Lockout/Override**

**Other Satellite Navigation System guidance**

**AC 20-138C Airworthiness Approval of Positioning and Navigation Systems**

**GPS / WAAS Field Approval Decision Process**

# AFS-300 MAJOR REPAIR/ALTERATION JOB AID SPECIFIC SYSTEM GUIDANCE OVERVIEW

## SATELLITE NAVIGATION SYSTEMS

### GPS/WAAS Field Approval Decision Process

Note: The following definitions and discussion correspond to steps in the decision tree.

**Previously approved data – Refers** to data that was used to substantiate an alteration on another aircraft via Type Certificate (TC), Amended Type Certificate (ATC), Supplemental Type Certificate (STC) or Amended Supplemental Type Certificate (ASTC). The approval does not extend to the aircraft currently being altered. It must be shown that the data from the previous installation is appropriate and applicable to the alteration being considered. The mere existence of a previous installation approval is not sufficient in and of itself to substantiate a proposed alteration. The applicant must provide substantiation data for the proposed alteration and show compliance with the applicable requirements. Several factors are related to establishing applicability and are addressed in a separate discussion.

**Partial Applicability** – Refers to previously approved data as defined in this memo. Though some portion of that data may be shown to be applicable it does not completely apply to or substantiate the alteration. See the discussion of determining data applicability.

**Upgrade** – Means altering a system to replace or modify the equipment by adding features or functions. The intent is that an upgrade applies to an equipment alteration from the same manufacturer as the original installation. An upgrade example is adding Localizer Performance with Vertical guidance (LPV) capability provided by manufacturer X to an existing GPS installation from manufacturer X.

**Simple Upgrade** – Is one in which the system has no vertical coupling, is not an Electronic Flight Instrument System (EFIS) and has limited external interfaces. This will also generally apply to a 14 CFR Part 23 aircraft using Part 23 related data. For purposes of this memo EFIS does not refer to the panel mount Class Gama navigators that include displays, e.g. GNS430/530. Installation of equipment that has advanced or complex capabilities may not constitute a complex upgrade if those features aren't activated. An example of this situation is one in which the GPS is upgraded to GPS/WAAS with LPV capability. If the LPV vertically coupled capability is not used either by choice or due to aircraft configuration, the alteration could be a simple upgrade.

Alteration, including upgrade, of a 14 CFR Part 25 aircraft is not usually considered to be simple due to the systems design concept applied to these aircraft.

**Flight Test vs. Flight Evaluation** – Flight Test is performed to develop and gather substantiating data for an airworthiness approval on an aircraft or system that has been altered. Flight testing is generally performed during an article's first approval by TC, ATC, or STC and involves a request for Type Inspection Authorization. Flight Evaluation is an operational check of an aircraft or system after maintenance or alteration to ensure the installed article functions properly. A flight evaluation can be conducted by an

## GPS/WAAS Field Approval Decision Process - continued

appropriately rated pilot with at least a private pilot certificate who logs the flight and specific criteria evaluated in the aircraft records.

Refer to 14 CFR 91.407.

**Determining data applicability (Figure 3) -** How much or how little previously approved data applies to a particular installation depends upon how similar the proposed installation is to the original. It is the applicant's responsibility to show that their data is applicable. General guidance to determine applicability includes:

- Is the basis of certification of the aircraft to be altered the same as or equivalent to the basis to which the original installation was certified?
- Are there significant differences in the on-board equipment or avionics suite?
- Are there significant differences in software function? Are the equipment interfaces, data transfer busses, and intended functions identical?

Care should be taken when using previously approved data for a new application. Although it may not seem necessary for a complete review of previously approved data, some review is often necessary. Even in situations where the reuse of the data seems to be obviously acceptable, there are things that must be considered when approving the data for the new application. These include:

1. Differences in certification basis: The data may have been originally approved under a different certification basis than the new application of the data. Different amendments of regulations (either newer or older) or new regulations may be applicable to the new application.
2. Special conditions: The original approval may have included special conditions as part of the certification basis or the new application of the original data may require a special condition.
3. Airworthiness Directives: Different airworthiness directives may be applicable to the new application than the original application.
4. Equivalent Level of Safety (ELOS) Findings: The original approval may have been based on an equivalent level of safety finding. The applicable regulations need to be reviewed and if necessary the ELOS finding must be approved by the applicable directorate.
5. Exemptions: The original approval of the data may have been based on an exemption to regulations. If so, the applicable rule must be complied with or a request for an exemption must be submitted.
6. The interaction of other modifications must be addressed.
7. The installation or upgrade of systems in Part 27 or Part 29 rotorcraft require that consideration be given to the equipment involved and its suitability for rotorcraft. The DO-160 testing accomplished during Technical Standard Order (TSO) certification of a

## GPS/WAAS Field Approval Decision Process - continued

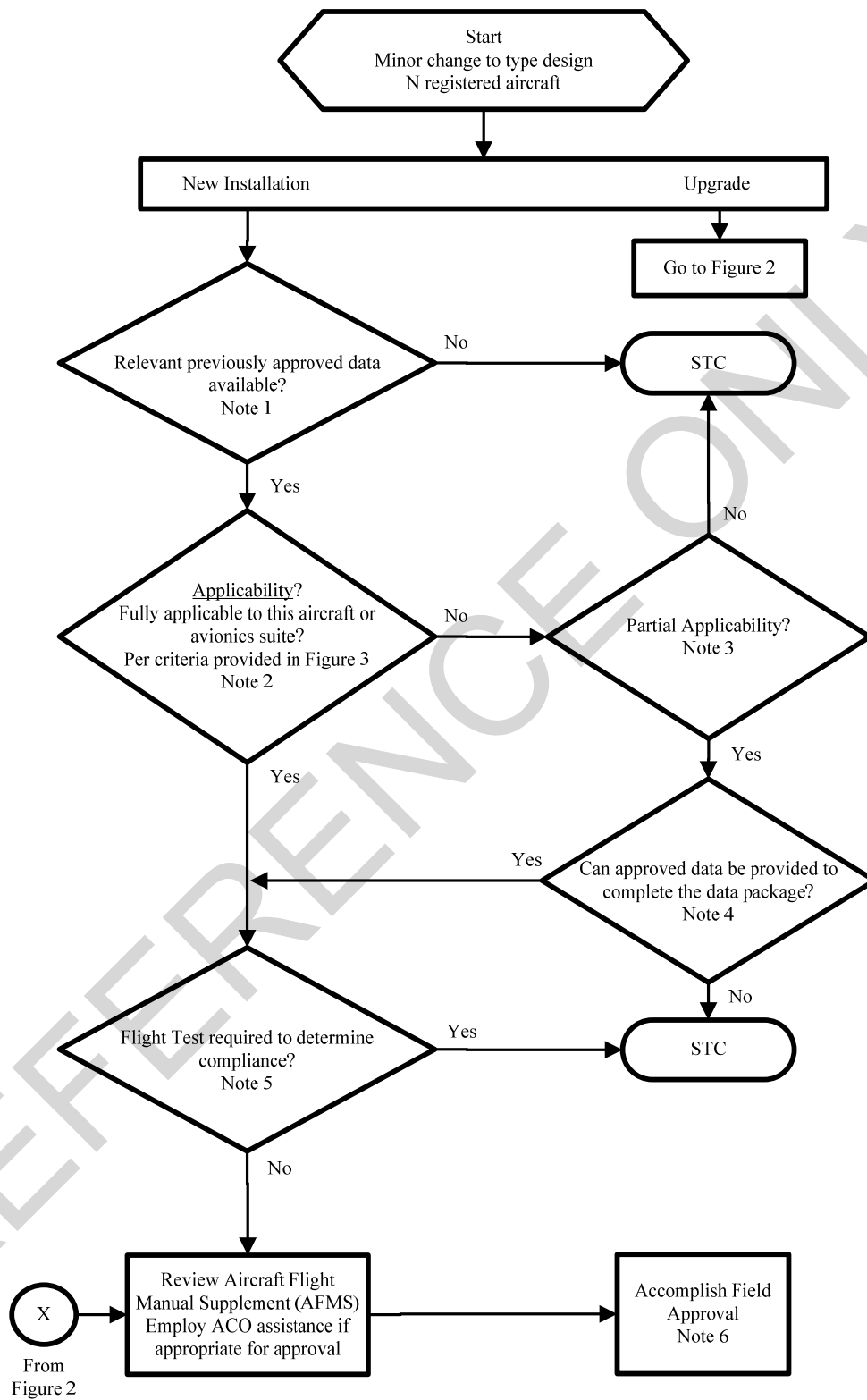
unit may not be sufficient for rotorcraft. Testing to higher levels for environmental factors such as vibration and greenhouse effect may be necessary compared to those for fixed wing aircraft.

8. Autopilot Compatibility: When upgrading existing systems to Satellite-Based Augmentation Systems (SBAS) with Localizer Performance with Vertical guidance (LPV) approach capability it is critical that the SBAS equipment interface is compatible with the aircraft. In particular, the signals normally provided by the radar altimeter or by marker beacon passage for autopilot gain scheduling are not provided by the SBAS system.

Additionally, TSO Authorization (TSOA) data is approved data and may be used to the extent that the TSOA data aligns with the applicable installation airworthiness requirements. Where the TSOA data aligns with the applicable airworthiness requirements, the TSOA is sufficient evidence of compliance.

REFERENCE ONLY

## GPS/WAAS Field Approval Decision Process - continued



**Figure 1. GPS/WAAS Decision Tree**



## GPS/WAAS Field Approval Decision Process - continued

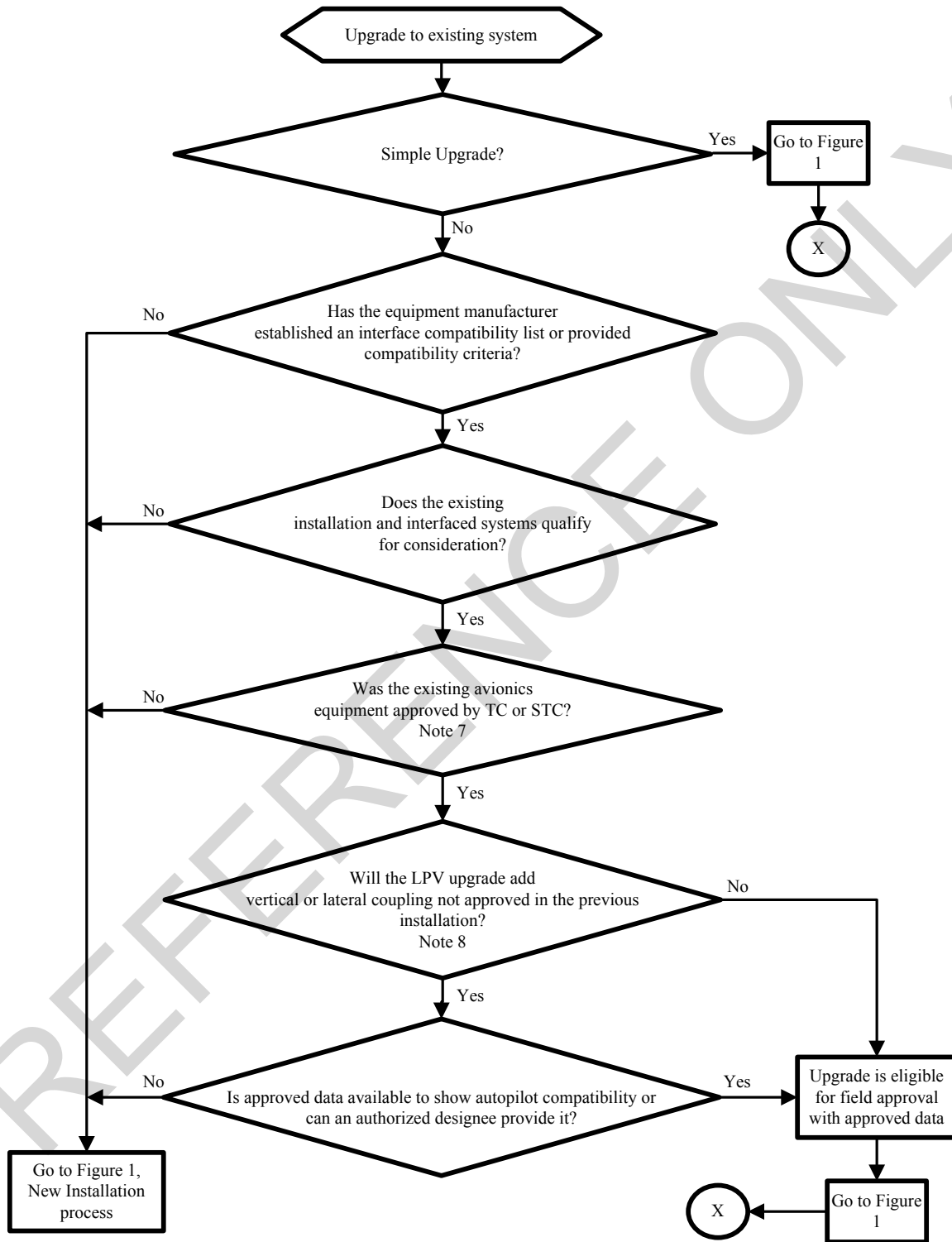


Figure 2. GPS/WAAS Decision Tree

## GPS/WAAS Field Approval Decision Process - continued

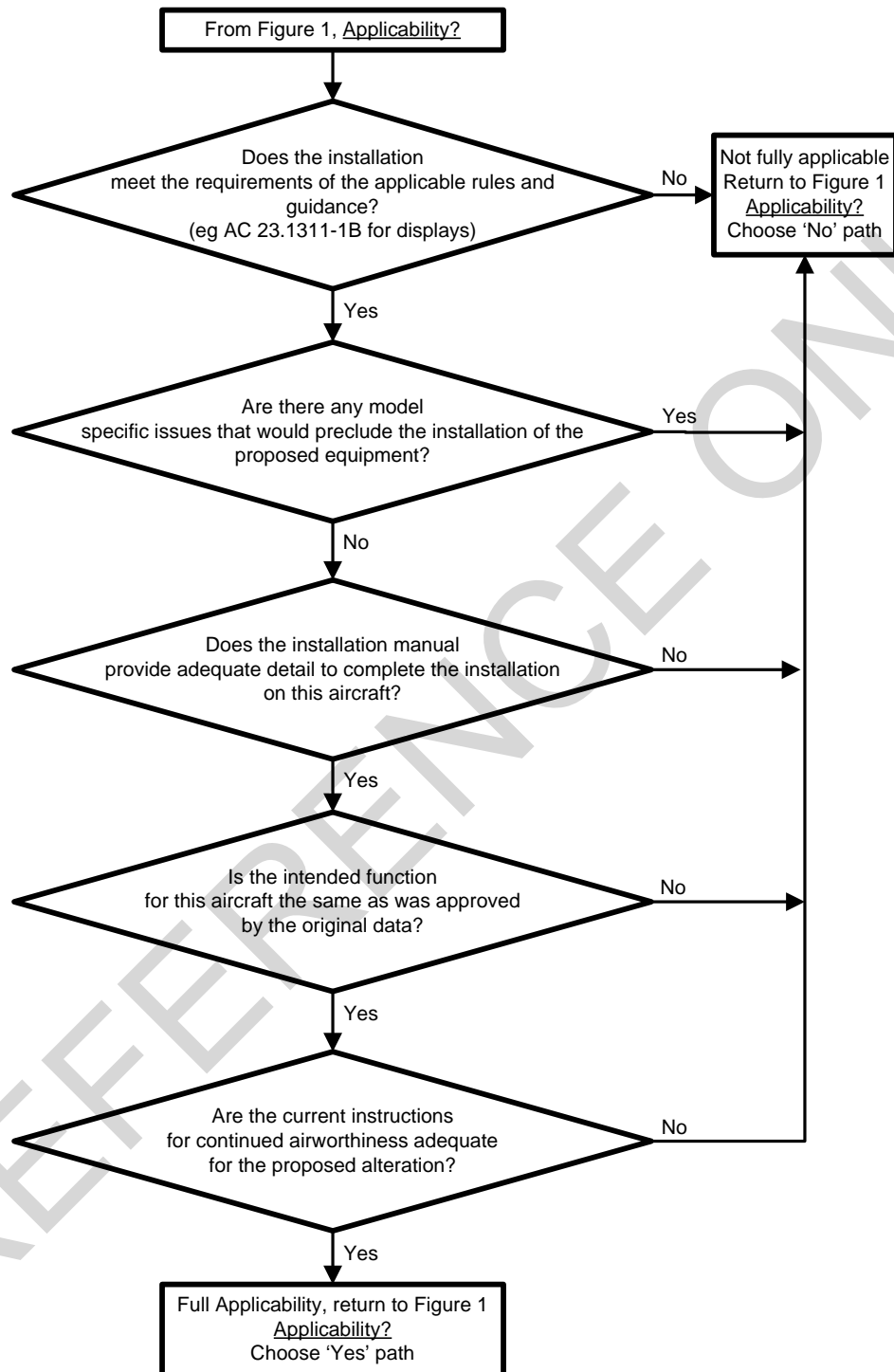


Figure 3. GPS/WAAS Decision Tree

## GPS/WAAS Field Approval Decision Process - continued

### Alteration Decision Tree Notes

- Note 1: The data may be from an STC or other approved alteration. The data must be relevant to the alteration in question and from similar aircraft, equipment and functions.
- Note 2: To answer the applicability question you are directed to Figure 3 where the decision is made as to whether the data is fully or partially applicable or the data is not applicable at all.
- Note 3: If the data is not fully applicable as determined in Figure 3, there may be partial applicability. The extent of applicability should be determined at this stage and proceed to the next question.
- Note 4: If partial applicability of the data to this alteration has been established, the necessary approved data may be provided through DER or with ACO assistance.
- Note 5: If there is not a need to develop substantiating data through flight test, the alteration will likely only require a Flight Evaluation (see Flight Test vs. Flight Evaluation)
- Note 6: Accomplish Field Approval following guidance provided in FSIMS 8900.1, Volume 4, and Chapter 9.
- Note 7: The avionics equipment that is being upgraded on the aircraft in question must have been approved by TC or STC. If not, it doesn't mean that the upgrade can't be field approved, only that some further engineering evaluation and approved data will be necessary.
- Note 8: If coupling is being added that was not already wired, approved data will have to be provided to show autopilot compatibility.

AFS-300 MAJOR REPAIR/ALTERATION JOB AID  
SPECIFIC SYSTEM GUIDANCE OVERVIEW

TRAFFIC ADVISORY, ALERTING, AND AVOIDANCE

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**NOTE: This is not an all-inclusive list of applicable guidance.**

\*\*\*\*\*

FAA Order 8900.1, effective 09/03/2007 cancelled FAA Order 8300.10, Airworthiness Inspector's Handbook. At the time Order 8300.10 was cancelled, its appendix contained certain Flight Standards Information Bulletins for Airworthiness (FSAW) that were the sole source of historical information, certain technical information, and authorization for inspectors to perform approvals of Flight Manual Supplements or Supplemental Flight Manuals. To preserve the policies and practices described in selected FSAWs InFO 08047 was issued. This InFO states that the following FSAW's expiration dates are considered to be NONE and that they will not expire until they have been incorporated into FSIMS, superseded by another bulletin or order, or cancelled: FSAW 94-32C, FSAW 94-41, FSAW 95-09E, FSAW 97-09, FSAW 98-04D and FSAW 02-03A. A synopsis of the FSAW content applicable to your search is provided below.

**InFO 08047**

**Overview**

- Lists specific make and model TCAD and TAS equipment that have been installed by STC in various make and models of aircraft.
- Provides that approved data developed for STC issuance may be used to substantiate field approval
- States the conditions and limits that apply to field approval of installation and operational use
- Authorizes ASI approval of flight manual supplements and provides associated conditions and limitations.

**FSAW 98-04D**

**Field Approvals of Traffic Collision Alerting Device (TCAD), Traffic Advisory Systems (TAS), and Traffic Alert and Collision Avoidance Systems I (TCAS I)**

**Other Traffic Advisory, Alerting and Avoidance guidance**

**AC 20-131A**

**Airworthiness Approval of Traffic Alert and Collision Avoidance Systems (TCAS II) and Mode S Transponders**

AFS-300 FIELD APPROVAL JOB AID  
SPECIFIC SYSTEM GUIDANCE OVERVIEW

TERRAIN AVOIDANCE AND WARNING

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**NOTE: This is not an all-inclusive list of applicable guidance.**

\*\*\*\*\*

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**InFO 08047**

**Overview**

- States the requirement for initial installation of TAWS
- Explains the requirements and limits for follow-on field approval of Class B TAWS
- Authorizes ASI approval of flight manual supplements and the conditions for approval

**FSAW 02-03A**

**Follow-On Approval of Class B Terrain Awareness and Warning Systems (TAWS)**

**Other Terrain Avoidance and Warning guidance**

**AC No: 23-18**

**Installation of Terrain Awareness and Warning System (TAWS) Approved for Part 23 Airplanes**

**AC 25-23**

**Airworthiness Criteria for the Installation Approval of a Terrain Awareness and Warning System (TAWS) for Part 25 Airplanes**

Continued on next page

AFS-300 FIELD APPROVAL JOB AID  
SPECIFIC SYSTEM GUIDANCE OVERVIEW

TERRAIN AVOIDANCE AND WARNING

**AC 27-1B**

**Certification of Normal Category Rotorcraft**

**AC 29-2C**

**Certification of Transport Category Rotorcraft**

REFERENCE ONLY

**AFS-300 Major Repair / Alteration Job Aid**

**Feedback Form**

**Please submit comments or recommendations by emailing this form to:**

**AFS-300-JobAid@faa.gov**

**The following error (technical or typographical) has been noted:**

**Recommend the following change:**

**In a future change to this job aid please include:  
(briefly describe)**

**Other comments:**

**Submitted by:**

**Date:**

**Telephone Number:**

**Routing Symbol:**

REFERENCE ONLY