Major Repair and Alteration Data Approval

Online Job Aid

May 2016

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FAA
Flight Standards Service
Aviation Maintenance Division AFS-300

Job Aid

Major Repair and Alteration Data Approval

This job aid includes additional information to FAA Order 8300.16, Major Repair and Alteration Data Approval (may be accessed at rgl.faa.gov, under the Orders/Notices database listing).

Order 8300.16 provides guidance to FAA aviation safety inspectors (ASI), Aircraft Certification Offices (ACO), Designated Engineering Representatives (DER), and Designated Airworthiness Representatives (DAR) with Function Code 51.

AFS-300 MAJOR REPAIR/ALTERATION JOB AID
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 typical approval path is designated for each item.
4) Many items have additional guidance or information that is accessible using provided links.
5) Access the linked information by clicking on the hyperlink.

Navigating This Document

This job aid is configured to open with bookmarks displayed. Bookmarks are a convenient way to locate a particular topic and to navigate within the job aid. Click on the bookmark icon at the left of the window to view that page.
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"

For your convenience a previous view button has been provided on the pages of this document.

Note: Due to the characteristics of pdf documents, resizing of pages and some other actions when viewing this job aid may result in the "previous view" button locking into a loop between the same two views. Use the bookmarks to move to the desired page.

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
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

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FEEDBACK FORM

AFS-300 MAJOR REPAIR/ALTERATION JOB AID
ELIGIBILITY CONSDERATIONS FOR FIELD APPROVAL

The following lists indicate which method(s) may be used for approval of data supporting 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. STC. Items with the letters "**STC**" identify changes that typically are determined to be major changes to type design and require an STC. With the complexity of broad applications concerning major alterations, inspectors occasionally encounter a situation in which the guidance material identifies "**STC**", but the applicant feels the change doesn't warrant approval as a major change to the product's type design. See the discussion below for the reclassification process.

2. EVL. Data supporting 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. ENG. Data supporting items designated "Engineering" by the letters "**ENG**" may be eligible for approval by means other than a STC, however may not qualify for field approval. This data may be obtained from a Designated Engineering Representative (DER), Organization Designation Authorization (ODA) approved engineering data, or through ACO coordinated field approval.

4. Reclassification Process. If the applicant believes that the change does not warrant an STC, the applicant may request a reclassification for the specific alteration. The process for reclassification is outlined in Figure 1. In all cases it is highly encouraged that electronic communication (e-mail) be used to expedite the process. In most cases, it should take less than one work week to review and provide a concurrence/non-concurrence recommendation.

a. The applicant will forward the request for reclassification to the local Flight Standards District Office (FSDO) . The FSDO should ensure that a complete request includes at a minimum:

- A description of the alteration to include information justifying the reclassification and identification of the product it is being installed on.

- The correct identification of the section in the Major Repair/Alteration Job Aid against which a reclassification is being requested, including the revision status of the job aid.

b. Each FSDO will evaluate the request using their best judgment.

(1) If the FSDO does not concur, they will notify the applicant with an explanation why the reclassification request was inappropriate. The applicant may request the FSDO review of a non-concur using FAA Consistency and Standardization Initiative (CSI) procedures.

(2) If the FSDO supports the reclassification and believes further consideration is warranted, the FSDO will send their concurrence, along with the request to the appropriate Aircraft Certification Office (ACO), preferably by electronic communication.

c. The ACO will evaluate the request from an engineering standpoint using their best judgment.

(1) If the ACO does not concur with the reclassification request, the ACO will notify the FSDO with an explanation why the reclassification request was inappropriate. The FSDO will forward this to the applicant.

(2) If the ACO concurs with the reclassification request, the ACO will forward the request and their concurrence to the appropriate product directorate, if required, for review.

(3) The product directorate will review and return either a concurrence or non-concurrence with appropriate reasoning to the ACO within seven (7) working days. Correspondence should be in electronic form.

(4) The ACO will then return the request with the concurrence or non-concurrence to the FSDO.

(5) The FSDO will then inform the applicant that the repair or alteration does not require a STC and will evaluate the package accordingly.

(6) In addition, the ACO will forward the reclassification request and concurrences to the Aircraft Engineering Division (AIR-100), and (AFS-300) for monitoring purposes.

(Continued on next page)

Note: The FSDO should ensure that the applicant has referenced the concurrence on the FAA Form 337 prior to issuing the field approval or documenting the alteration with approved data.

Note: If the product directorate requires concurrence before returning the request the ACO will follow the product directorate's procedure for review prior to returning the request.

d. AIR-100 will monitor the reclassifications mailbox and evaluate the reclassifications for trending and indications of need to coordinate with the Aircraft Maintenance Division (AFS-300), for possible updates to the Major Repair/Alteration Job Aid. AFS-300 will establish the review and update process for the Major Repair/Alteration Job Aid. This review and update will involve appropriate participation from the directorates and AIR-100.

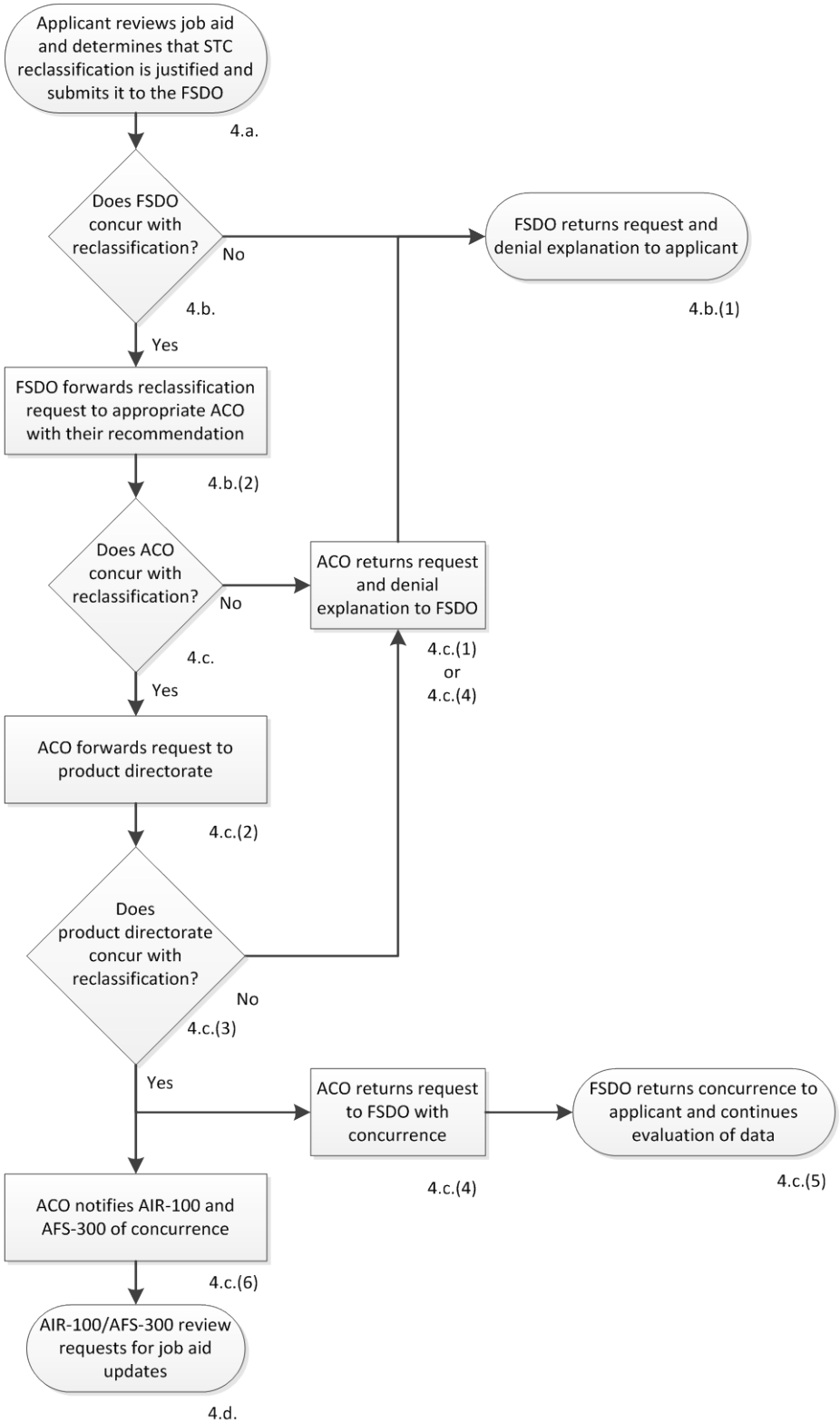
Use the following mailboxes for reclassification requests:

- AIR-100: 9-AVS-Alteration-Reclassification@faa.gov
- AFS-300: 9-AVS-Alteration-Reclassification@faa.gov
- Small Aircraft Directorate: 9-AIR-ACE-Reclassification@faa.gov
- Rotorcraft Directorate: 9-ASW-Rotor-Safe@faa.gov

(Continued on next page)

PREVIOUS VIEW

Figure 1. Reclassification Review Process.



PREVIOUS VIEW

AFS-300 MAJOR REPAIR/ALTERATION DATA APPROVAL
LINKS TO GENERAL GUIDANCE AND INFORMATION

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.

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

PREVIOUS VIEW

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 dependent 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 DATA APPROVAL

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:

Weight & Balance

Structural strength

Reliability

Operational Characteristics

Avionics

Systems

Crashworthiness

Main Menu

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).

A. Weight and Balance (W&B)

Element	Description	Classification
A.1	Changes that increase the certificated maximum weight limits (increases in the maximum gross weight, maximum takeoff, or landing weights).	STC
A.2	Changes in the certificated center of gravity (CG) range limits (for example, decreasing the forward limit or increasing the aft limit).	STC
A.3	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. Structural Strength

Element	Description	Classification
B.1	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). Note: See Policy Statement AIR-100-14-130-001 for size limits data requirements for bonded repairs.	ENG
B.2	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	Substituting airframe primary structural materials (i.e alloy substitutions).	ENG
B.4	Substituting an engine or propeller (such as replacing a reciprocating engine with a turbine engine).	STC

NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY AIRPLANES

Element	Description	Classification
B.5	Substituting or altering a reciprocating engine such that the net result is an increase of more than 10 percent greater horsepower. 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	Effects from changes above that affect flutter and vibration for any of the aforementioned changes.	STC
B.7	Structural reinforcements not affecting flutter (i.e. using the same material specified by the manufacturer of the next thicker size).	EVL
B.8	Substituting blind fasteners in primary load structures. 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.	ENG
B.9	Altering passenger-carrying aircraft to an all-cargo or combination configuration.	STC
B.10	Interior reconfigurations from one passenger configuration to another or one cargo configuration to another cargo configuration.	ENG

C. Reliability

Element	Description	Classification
C.1	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
C.2	Changes to the basic engine or propeller design, or controls, that affect the product operating limitations.	STC
C.2a	Changes to the basic engine or propeller design, controls that *do not* affect the products operating limitations.	ENG
C.3	Changes that include engine/propeller adjustments and settings limitations that affect power output.	ENG

Element	Description	Classification
C.4	Modifications to approved avionics equipment that affect functionality, reliability and/or airworthiness, such as:	
C.4a	Deviating from the component manufacturer's specific operating limitations.	ENG
C.4b	Changes to operating system or imbedded software applications. This does not include navigation, terrain, synthetic vision system, and surface navigation/guidance databases.	STC
C.4c	Changes to airplane structural, physical, electrical properties, or equipment that could adversely affect Reduced Vertical Separation Minimum (RVSM) systems and airplane performance.	ENG
C.4d	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

D. Operational Characteristics

Element	Description	Classification
D.1	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
D.2	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
D.3	Changes in control surface travel, control system mechanical advantage, location of control system component parts, or direction of motion.	ENG
D.4	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
D.5	Changes in canopies, windows, and doors on unpressurized aircraft.	ENG
D.6	Changes in engine cowlings that do not affect the flow of engine cooling air and carburetor/fire/ignition heat rises.	EVL

NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY AIRPLANES

Element	Description	Classification
D.7	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
D.8	Changes that affect aircraft performance, drag, engine power, revolutions per minute (rpm), or exhaust muffler.	ENG
D.9	Changes that increase the differential pressure limits of an atmospheric or climatic control system of aircraft interior compartments.	STC
D.10	Changes in engine and propeller combination (vibration approval).	ENG
D.11	Changes affecting noise.	ENG
D.12	Changes affecting flight characteristics.	ENG
D.13	Installation of systems such as:	
D.13a	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
D.13a(1)	Aircraft systems that directly connect to external services and networks under the following conditions: 1. The external service or network is non-governmental; 2. The aircraft system receives information from the non-governmental service or network; and, 3. The failure effect classification of the aircraft system is "major" or higher. See Policy Statement AIR-21.16-02	STC
D.13b	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
D.13c	Using new or different alternators, generators, starters, or vacuum pumps on reciprocating engines only.	EVL

NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY AIRPLANES

Element	Description	Classification
D.13d	Health Usage Monitoring Systems (HUMS) or Data Transfer Units (DTU)	ENG
D.13e	Head-up display (HUD), enhanced flight vision systems (EFVS), or Synthetic Vision Systems (SVS) used for primary navigation	STC
D.13f	Traffic collision alerting device (TCAD), traffic advisory systems (TAS), Traffic Alert and Traffic Alert and Collision Avoidance System I (TCAS I) (see Technical Paper AFS-360-2014-4). See: Traffic Advisory Alerting and Avoidance Guidance	EVL
D.13g	TCAS II. See: Traffic Advisory Alerting and Avoidance Guidance	STC
D.13h	Autopilots (AP), Flight Guidance Systems, and automatic flight control systems (AFCS) or flight directors (FD)	STC
D.13h(1)	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
D.13i	Cockpit voice recorders (CVR) and associated interfaces.	EVL
D.13j	Flight data recorders (FDR) and associated sensors or digital flight data acquisition units (DFDAU) required by operating rule.	STC
D.13j(1)	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. See: Technical Paper AFS-360-2015-1	EVL
D.13k	Electronic flight instrument systems (EFIS) that display primary flight information to meet regulatory operating requirements.	STC

Element	Description	Classification
D.13l	Electronic horizontal-situation indicators (EHSI). (See the current edition of AC 23.1311-1, Installation of Electronic Display in Part 23 Airplanes, and Technical Paper AFS-360-2014-1.) See: Technical Paper AFS-360-2014-1 Policy Statement ACE-23-08	EVL
D.13m	Ground proximity warning systems (GPWS). See: Terrain Avoidance and Warning Guidance	STC
D.13n	Terrain Awareness and Warning Systems (TAWS-A) See: Terrain Avoidance and Warning Guidance	EVL
D.13o	Terrain Awareness and Warning Systems (TAWS-B) See: Terrain Avoidance and Warning Guidance	EVL
D.13p	Emergency Vision Assurance System (EVAS).	STC
D.13q	Mounting fixtures or brackets for portable devices such as Global Positioning System (GPS) or Electronic Flight Bag (EFB). See: Policy Statement ACE-23-01.	EVL
D.13r	GPS or Global Navigation Satellite System (GNSS). See: Satellite Navigation System Guidance 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.	EVL

Element	Description	Classification
D.13s	Multi-sensor Navigation System (including Navigation Management Systems (NMS) and flight management systems (FMS)). See: Satellite Navigation System Guidance 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
D.13t	Multifunction displays (MFD) or Electronic Map Displays (EMD) See: AC 23.1311-1 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 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.	ENG
D.13u	Electronic Flight Bag (EFB) Class 1 and Class 2 mounting devices, data connectivity and aircraft power connections. See: AC 120-76, Guidelines for the Certification, Airworthiness, and Operational Approval of Electronic Flight Bag Computing Devices. NOTE: Class 1 and Class 2 EFB units themselves are considered to be portable electronic devices (PED) and do not require installation approval.	ENG
D.13v	EFB Class 3 employing Type A, B and/or C software applications. See AC 120-76 and FAA Order 8900.1	STC

Element	Description	Classification
D.13w	Night vision goggles (NVG) environments including existing lighting and Night Vision Imaging System (NVIS) arrays. See: Night Vision System Guidance	STC
D.13x	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
D.13y	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
D.13z	HID lighting installed and intended for use as primary lighting required to meet performance under the airworthiness standards requires approval by STC.	STC
D.13aa	Anti-terrorism countermeasures, including flares and dispensing systems.	STC
D.13bb	Automatic Dependent Surveillance-Broadcast (ADS-B). See: ADS-B Out System Guidance	
D.13cc	Non-required/Supplemental Angle of Attack (AoA) Systems providing supplemental information when classified as major alteration	EVL
D.14	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

E. Changes to Systems that Affect Aircraft Airworthiness, Such as:

Element	Description	Classification
E.1	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
E.2	Changes to an existing or installation of a new icing protection system.	STC

NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY AIRPLANES

Element	Description	Classification
E.3	Changes to or relocation of exterior fuel vents, fuel drains, or battery vents. (Applicable to components not attached to the basic engine.)	EVL
E.4	Changes to crew or passenger liquid oxygen (LOX) or onboard generating systems.	ENG
E.5	Changes to external, critical access doors, auxiliary power unit (APU) ram air, nacelle blowout doors, fuel drain.	ENG
E.6	Changes to oil, hydraulic, pneumatic, and fuel lines, or systems that affect their operation or installation and flammability requirements, such as:	
E.6a	New types of hoses and/or hose fittings that may not meet installation requirements, such as flow rate and flammability requirements.	ENG
E.6b	New type fuel dump valves.	EVL
E.6c	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
E.6d	Change to, or addition of, permanent fuel tanks or fuel system components, including sealants.	ENG
E.7	Changes in fixed fire extinguisher or detector systems that affect the system's effectiveness or reliability, such as:	
E.7a	Relocating discharge nozzles, detector units, or fixed fire extinguisher bottles.	ENG
E.7b	Using new or different detector components.	ENG
E.7c	Decreasing the amount or changing the type of extinguishing agents.	ENG
E.8	Alterations or repairs that include:	
E.8a	Changes that include substituting airframe materials that affect structural integrity, lightning protection, HIRF protection, flight characteristics or performance.	ENG
E.8b	Use of synthetic covering materials.	EVL

Element	Description	Classification
E.8c	Use of new titanium or magnesium applications.	ENG
E.8d	Use of ceramic coatings.	ENG
E.8e	Use of synthetic coatings.	ENG
E.8f	Use of new plated coatings.	ENG
E.8g	Use of Vinyl Shrink wraps, not to include decals or logos in limited areas	STC

F. Crashworthiness

Element	Description	Classification
F.1	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
F.2	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.

NOTE: Seating configuration impacts the applicability of certain regulatory requirements (e.g. 14CFR 91.223, 91.609, 135.152, and 135.411).

See: Legal Interpretation Dukats, April 16, 2008
FAA Order 8900.1, V2C4S8

NOTE: Some seemingly minor changes, such as relocating an existing seat one inch, could have the effect 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.

NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY AIRPLANES

NOTE: Complete initial interior installations require application for an STC or amended TC.

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

NOTE: Refer to Order 8300.16, Chapter 3, paragraph 6 for guidance related to field approvals on aircraft operated under Part 121

AFS-300 MAJOR REPAIR/ALTERATION DATA APPROVAL

TRANSPORT CATEGORY AIRPLANES

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

Click to select

Weight & Balance

Structural strength

Reliability

Operational Characteristics

Avionics

Systems

Crashworthiness

Main Menu

PREVIOUS VIEW

A. Weight and Balance

Element	Description	Classification
A.1	Changes in the certificated CG range limits (for example, decreasing the forward limit or increasing the aft limit).	STC
A.2	Changes that increase the operational limits (maximum speed limits such as V_A, Vc, 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
A.3	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
A.4	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. Structural Strength

Element	Description	Classification
B.1	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. See: AC 25.571-1 PS-AIR-100-14-130-001, Bonded Repair Size Limits	STC

Element	Description	Classification
B.2	The *following three exceptions* 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. NOTE: All the following exceptions require damage tolerance approval. DER/ODA approvals for static strength alone are not permissible.	
B.2a	*Exception 1:* 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: *1.* Compliance with the damage tolerance requirements of at amendment 25-45 or later amendments is demonstrated and approved for the alteration and the affected PSE (e.g., skin, stringers, frames etc.). *2.* The modification is contained within one frame-stringer bay (area between adjacent frames and adjacent stringers).	ENG
B.2b	*Exception 2:* 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 etc.).	ENG
B.2c	*Exception 3:* 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, amdt 25-45 or later, is demonstrated and approved for the alteration and the affected PSE (e.g., skin, frames, stringers, floor beams, etc.).	ENG

Element	Description	Classification
B.3	Changing the structural panels and load-bearing components that could affect service life.	STC
B.4	Changing internal frame, longeron, or structural members.	STC
B.5	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	Changes to landing gear and related system and structural components, including wheels, brakes, and tires.	STC
B.7	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	Effects from changes above that affect flutter and vibration for any of the aforementioned changes.	STC
B.9	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)." 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)."	ENG
B.10	Changes of passenger-carrying aircraft to an all-cargo or combined passenger-cargo ("combi") configuration.	STC

C. Reliability

Element	Description	Classification
C.1	Changes to manifolding, air induction systems or air intake doors, engine cowling, or baffle that affect the flow of engine cooling air.	STC

Element	Description	Classification
C.2	Changes to the basic engine or propeller design, controls, and operating limitations.	STC
C.3	Changes that include engine/propeller adjustments and setting limitations that affect power output.	STC
C.4	Modifications to approved avionics equipment that affect functionality, reliability and/or airworthiness, such as:	See below
C.4a	Deviating from the design environment qualifications, or minimum performance standards as specified under TC or amended type certificate (ATC).	STC
C.4b	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
C.4c	Deviating from the component manufacturer's specified operating limitations.	STC
C.4d	Changes to airplane structural, physical, electrical properties, or equipment that could adversely affect RVSM systems and airplane performance.	ENG
C.4e	Changes to operating system or imbedded software applications. This does not include navigation, terrain, synthetic vision system, and surface navigation/guidance databases.	STC

D. Operational Characteristics

Element	Description	Classification
D.1	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
D.2	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
D.3	Changes to control surface travel, method of control system mechanical advantage, or direction of motion.	STC

TRANSPORT CATEGORY AIRPLANES

Element	Description	Classification
D.4	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, tip tanks, windows, and doors.	STC
D.5	Changes in engine cowlings or housings.	STC
D.6	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
D.7	Changes that affect aircraft performance, drag, engine power, rpm, or exhaust muffler.	STC
D.8	Changes that alter the aerodynamic contour that affect noise or flight characteristics.	STC
D.9	Installation of:	See below
D.9a	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
D.9a(1)	Aircraft systems that directly connect to external services and networks under the following conditions: 1. The external service or network is non-governmental; 2. The aircraft system receives information from the non-governmental service or network; and, 3. The failure effect classification of the aircraft system is "major" or higher. ee: Policy Statement AIR-21.16-02	STC
D.9b	Systems that extract power from drive systems, such as the environmental control system (e.g., ventilation, pressurization, temperature control systems, etc).	STC
D.9c	Health Usage Monitoring Systems (HUMS) or Data Transfer Units (DTU)	STC
D.9d	Head-up display (HUD), Enhanced Flight Vision Systems (EFVS), or Synthetic Vision Systems (SVS) used for primary navigation.	STC

Element	Description	Classification
D.9e	Traffic collision alerting device (TCAD), traffic advisory systems (TAS), and Traffic Alert and Collision Avoidance Systems (TCAS) I. See: Traffic Advisory, Alerting, and Avoidance Guidance	EVL
D.9f	TCAS II	STC
D.9g	Autopilot, Flight Guidance Systems, and automatic flight control systems (AFCS) or flight directors (FD)	STC
D.9h	Cockpit voice recorders (CVR) and associated interfaces.	ENG
D.9i	Flight data recorders (FDR) and associated sensors or digital flight data acquisition unit (DFDAU)	STC
D.9j	Electronic flight instrument systems (EFIS).	STC
D.9k	Electronic Horizontal Situation Indicator (EHSI). See: Technical Paper AFS-360-2014-1	EVL
D.9l	Ground proximity warning systems (GPWS) See: Terrain Avoidance and Warning Guidance	ENG
D.9m	Terrain Avoidance and Warning Systems (TAWS) – A See: Terrain Avoidance and Warning Guidance	ENG
D.9n	TAWS-B. See: Terrain Avoidance and Warning Guidance	ENG
D.9o	Mounting fixtures or brackets and wiring must meet the flammability requirements of §§ 25.853(a) and 25.1713(c).	ENG
D.9p	Global Positioning System (GPS) or Global Navigation Satellite System (GNSS). See: Satellite Navigation System Guidance 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

Element	Description	Classification
D.9q	Multi-sensor navigation system (including Navigation Management Systems (NMS) and flight management systems (FMS)). See: Satellite Navigation System Guidance 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
D.9r	Multifunction Displays (MFD) or Electronic Map Displays (EMD). See: Advisory Circular AC 25-11 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.	ENG
D.9s	Electronic Flight Bag (EFB) Class 1 and Class 2 Mounting devices, data connectivity, and aircraft power connections. See Advisory Circular AC 120-76 NOTE: Class 1 and Class 2 EFB units themselves are considered to be portable electronic devices (PED) and do not require installation approval.	ENG
D.9t	EFB Class 3 employing Type A, B, and/or C software applications. (See AC 120-76 and FAA Order 8900.1 for instructions.)	STC
D.9u	Emergency Vision Assurance System (EVAS)	STC
D.9v	Night vision goggles (NVG) environments including existing lighting and Night Vision Imaging System (NVIS) arrays. See: Night Vision Imaging System Guidance	STC

Element	Description	Classification
D.9w	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
D.9x	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.	ENG
D.9y	HID lighting installed and intended for use as primary lighting required to meet performance under the airworthiness standards requires approval by STC.	STC
D.9z	Anti-terrorism countermeasures, including flares and dispensing systems.	STC
D.9aa	Automatic Dependent Surveillance - Broadcast (ADS-B) See: ADS-B Out System Guidance	
D.9bb	Electrical generation and distribution components.	STC
D.10	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
D.11	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

E. Changes to Systems that Affect Aircraft Airworthiness, Such as:

Element	Description	Classification
E.1	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
E.2	Changes to an existing or installation of a new icing protection system.	STC
E.3	Changes to or relocation of exterior fuel vents, fuel drains, or battery vents. (Applicable to components not attached to the basic engine.)	STC
E.4	Changes to crew or passenger LOX or onboard generating systems.	**ENG**
E.5	Changes to external, critical access doors, APU ram air, nacelle blowout doors, fuel drain.	ENG

Element	Description	Classification
E.6	Changes that include substituting engine/propeller/airframe materials that affect structural integrity, lightning protection, or flight characteristics.	ENG
E.7	Changes to a critical or life-limited part, including engine/APU rotating parts.	STC
E.8	Changes that may require a showing of compliance for human factors requirements (for example, in flight deck instrumentation and controls).	STC
E.9	Changing or substituting engine/aircraft instrumentation required by a unique characteristic of the particular type design.	STC
E.10	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
E.11	Addition of systems equipment that may impact flutter or couple with vibrations. 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. NOTE: On jet equipped airplanes, a blade-out failure can result in additional failures through this phenomena.	STC
E.12	Changes that do not conform to the minimum standards in a TSO under which a particular component or appliance is manufactured	STC
E.13	Altering wiring, shielding, or bonding that may adversely affect protection against HIRF, EMI, lightning diversion or suppression.	STC

F. Changes to Oil, Hydraulic, Pneumatic, and Fuel Lines, or Systems or Their Components That Affect Their Operation or Installation and Flammability Requirements, Such as:

Element	Description	Classification
F.1	New types of hoses and/or hose fittings that may not meet installation requirements, such as those of flow rate and flammability.	ENG

Element	Description	Classification
F.2	New type of fuel dump valves.	ENG
F.3	New oil/fuel/hydraulic line materials.	ENG
F.4	New fuel tanks or fuel system components, including sealants.	STC

G. Changes in Fixed Fire Extinguisher or Detector Systems That Affect the System's Effectiveness or Reliability, Such as:

Element	Description	Classification
G.1	Relocating discharge nozzle, detector units, or fixed fire extinguisher bottles.	ENG
G.2	Using new or different detectors.	ENG
G.3	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

H. Alterations or Repairs, That include:

Element	Description	Classification
H.1	Changes that include substituting airframe materials that affect structural integrity, lightning protection, HIRF protection, flight characteristics or performance.	**ENG**
H.2	Use of synthetic covering materials.	ENG
H.3	Use of new titanium or magnesium applications.	ENG
H.4	Use of ceramic coatings.	ENG
H.5	Use of synthetic coatings.	**ENG**
H.6	Use of new plated coatings.	ENG

Element	Description	Classification
H.7	Changes to designs involving lithium batteries or battery systems except for the following cases: 1. Very small batteries or battery systems (e.g., button/coin cells) not required for safe operation of the airplane that have less than 2 watt-hours of energy and meet UL 1642, UL 2054 or International Electrotechnical Commission (IEC) 62133. 2. Non-rechargeable batteries or battery systems in accessible areas for which applicable special conditions have been established. If established, these requirements are identified in the certification basis section of the type certificate data sheet or supplemental type certificate. 3. Batteries or battery systems previously approved by an amended type certificate or supplemental type certificate project where the approved documents that substantiated compliance with the airworthiness requirements are applicable without change. --See H.7b on next page for important notes--	STC
H.7b	Notes: • An accessible area is defined as an area normally occupied by crew or passengers during flight and that is reachable with the contents of a hand fire extinguisher without moving any panel. • Design changes involving lithium batteries are highly visible at this time due to incidents that resulted in FAA Airworthiness Directives. • The National Transportation Safety Board and Air Accident Investigations Branch (AAIB) issued safety recommendations regarding lithium battery installations. The NTSB safety recommendation is documented in a letter to the FAA, dated May 22, 2014. The AAIB safety recommendation is in Bulletin S5/2013. • Requiring STCs for these changes will provide visibility to the FAA Transport Standards Staff (TSS) who is working to promote standardization in safety assessments and compliance findings. • These changes must comply with special conditions in addition to 14 CFR part 25. • Rechargeable batteries or battery systems have more failure modes resulting in more risk than non-rechargeable batteries or battery systems.	Additional notes

Element	Description	Classification
H.8	Changes to designs involving non-rechargeable lithium batteries or battery systems in accessible areas for which applicable special conditions are identified in the certification basis section of the type certificate data sheet or supplemental type certificate. Very small batteries or battery systems (e.g., button/coin cells) not required for safe operation of the airplane that have less than 2 watt-hours of energy and meet UL 1642, UL 2054 or International Electrotechnical Commission (IEC) 62133 are an exception that does not require an engineering evaluation. NOTE: The safety assessments for these changes will often be more straightforward than the lithium battery/battery system changes in item H.7. Coordinate with the ACO since compliance must be demonstrated to special conditions in addition to 14CFR part 25.	ENG

I. Crashworthiness

Element	Description	Classification
I.1	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.	ENG
I.2	Changes that affect access and use of emergency exits and passenger door configurations (e.g., emergency medical services, sport parachute jumping).	ENG

Element	Description	Classification
------	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. NOTE: Seating configuration impacts the applicability of certain regulatory requirements (e.g. 14CFR 91.223, 91.609, 135.152, and 135.411). See: Legal Interpretation, Dukats, 4/16/2008 FAA Order 8900.1, V2C4S8. 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. NOTE: Complete initial interior installations require application for an STC or amended TC.	Additional notes

MENU

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

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Main Menu

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

A. Weight and Balance (W&B)

Element	Description	Classification
A.1	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
A.2	Changes in the certificated CG range limits (for example, decreasing the forward limit or increasing the aft limit).	STC
A.3	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. Structural Strength

Element	Description	Classification
B.1	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. See: Policy Statement AIR-100-14-130-001 for size limits data requirements for bonded repairs.	STC
B.1a	Changing the structural panels and load-bearing components that could affect service life.	STC
B.1b	Changing internal frame, longeron, or structural members.	STC
B.1c	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
B.1d	Changes to landing gear and related systems including internal parts of shock struts, length, and geometry of members and structural components.	STC
B.1e	Changes to wheels, brakes, and tires.	ENG
B.1f	Substituting engine, rotor, or airframe primary structure materials.	STC

Element	Description	Classification
B.2	Effects from changes above that affect flutter and vibration for any of the aforementioned changes.	STC
B.3	Substituting blind fasteners in primary load structures. 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.	ENG

C. Reliability

Element		Classification
C.1	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
C.2	Change to the basic engine, or rotor design, controls, or operating limitations.	STC
C.3	Changes that include engine/rotor adjustments and setting limitations that affect power output.	STC
C.4	Modifications to approved avionics equipment that affect functionality, reliability and/or airworthiness, such as:	
C.4a	Deviating from the design environment qualifications, or minimum performance standards as specified under TC or amended type certificate (ATC).	STC
C.4b	Changes to appliances, other than those specified and approved by FAA mandatory action, which affects performance, functionality, or configuration that are 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.	ENG
C.4c	Deviating from the component manufacturer's specified operating limitations.	STC
C.4d	Changes to operating system or imbedded software applications. This does not include navigation, terrain, and synthetic vision systems and surface navigation/guidance databases.	STC
C.4e	Altering wiring, shielding, or bonding that may adversely affect protection against HIRF and EMI or lighting diversion or suppression.	ENG

D. Operational Characteristics

Element	Description	Classification
D.1	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
D.2	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
D.3	Changes in control surface travel, control system mechanical advantage, location of control system component parts, or direction of motion.	STC
D.4	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
D.5	Changes in canopies, windows, and doors, including installation of bubble or extended observation windows.	STC
D.6	Changes in engine cowlings or housings.	STC
D.7	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
D.8	Changes that affect aircraft performance, drag, engine power, rpm, or exhaust muffler.	ENG
D.9	Changes that alter the aerodynamic contour that affect noise or flight characteristics.	ENG
D.10	Installation of Avionics such as:	
D.10a	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
D.10a(1)	Aircraft systems that directly connect to external services and networks under the following conditions: 1. The external service or network is non-governmental; 2. The aircraft system receives information from the non-governmental service or network; and, 3. The failure effect classification of the aircraft system is “major” or higher. e: Policy Statement AIR-21.16-02	STC

Element	Description	Classification
D.10b	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
D.10c	Systems that extract power from drive systems, such as air conditioning power drawn from the tail rotor driveshaft.	STC
D.10d	Health Usage Monitoring Systems (HUMS) or Data Transfer Units (DTU)	STC
D.10e	Head-up display (HUD), enhanced flight vision systems (EFVS), or Synthetic Vision Systems (SVS) used for primary navigation	STC
D.10f	Traffic collision alerting device (TCAD), traffic advisory systems (TAS), Traffic Alert and Traffic Alert and Collision Avoidance System I (TCAS I) See: Traffic Advisory, Alerting, Avoidance Guidance	EVL
D.10g	TCAS II.	STC
D.10h	Autopilot, Flight Guidance Systems, and automatic flight control system (AFCS) or flight directors (FD).	STC
D.10i	Cockpit voice recorders (CVR) and associated interfaces.	EVL
D.10j	Flight data recorders (FDR) and associated sensors or digital flight data acquisition unit (DFDAU).	STC
D.10 k	Flight data monitoring systems (FDM) See: Technical Paper AFS-360-2015-1	EVL
D.10l	Electronic flight instrument systems (EFIS).	STC
D.10m	Electronic horizontal-situation indicators (EHSI). See: AC 27-1 AC 29-2 Technical Paper AFS-360-2014-1	EVL

Element	Description	Classification
D.10n	"Terrain Advisory Systems" are systems that can NOT hold the "HTAWS" designation. "Terrain Advisory Systems" cannot be used to meet any regulatory airworthiness or operational credit where "HTAWS" TSO-C194 is listed as a required system. "Terrain Advisory Systems" may contain some or all TSO-C194 equipment (has a TSO C194 label), but the system installed performance at the aircraft level either does not meet the TSO-C194 & DO-309 MOPS, or has not been evaluated under a TC or STC program to ensure the system installed performance meets the TSO-C194 & DO-309 MOPS. NOTE: Contact the Rotorcraft Directorate for clarification of this determination. See: Terrain Avoidance and Warning Guidance	EVL
D.10o	"HTAWS" is a system that meets TSO-C194 & DO-309 MOPS installed performance at the aircraft level. "HTAWS" can be used to meet any regulatory airworthiness or operational credit where "HTAWS" TSO-C194 is listed as a required system. "HTAWS" may contain some, none or all TSO-C194 equipment (has a TSO C194 Label), and the system installed performance at the aircraft level does meet the TSO-C194 & DO-309 MOPS, and has been evaluated under a TC or STC program to ensure the system installed performance meets the TSO-C194 & DO-309 MOPS. See: Terrain Avoidance and Warning Guidance NOTE: The Rotorcraft Directorate has determined that some HTAWS installations may not constitute a major change in type design, but we request the use of a TC amendment or STC as the method for approval due to the new and novel design and the importance of preventing hazardous or misleading information. Contact the Rotorcraft Directorate for clarification of this determination. NOTE: For requests to reclassify, follow the procedure provided in this job aid.	EVL

Element	Description	Classification
D.10p	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
D.10q	GPS or GNSS, without coupled LPV. See: Satellite Navigation Systems Guidance	ENG
D.10q(1)	GPS or GNSS, with coupled LPV. See: Satellite Navigation Systems Guidance NOTE: 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.	ENG
D.10r	Multi-sensor Navigation System (including NMS and FMS), without coupled LPV. See: Satellite Navigation Systems Guidance	ENG
D.10r(1)	Multi-sensor Navigation System (including NMS and FMS), with coupled LPV. See: Satellite Navigation Systems Guidance NOTE: 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.	ENG
D.10s	MFD or EMDs used as primary displays for required instruments (See AC 27-1 and AC 29-2.)	STC

Element	Description	Classification
D.10t	Multifunction displays (MFD) or Electronic Map Displays (EMD) (See AC 23.1311-1 and AC 25-11.) 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 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.	ENG
D.10u	Electronic Flight Bag (EFB) Class 1 and Class 2 mounting devices, data connectivity and aircraft power connections. See AC 120-76. NOTE: Class 1 and Class 2 EFB units themselves are considered to be PEDs and do not require installation approval.	ENG
D.10v	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
D.10w	Emergency Vision Assurance System (EVAS).	STC
D.10x	Night vision goggles (NVG) environments including existing lighting and Night Vision Imaging System (NVIS) arrays See: Night Vision Imaging Systems Guidance	STC
D.10y	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
D.10z	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

Element	Description	Classification
D.10aa	HID lighting installed and intended for use as primary lighting required to meet performance under the airworthiness standards requires approval by STC.	STC
D.10bb	Anti-terrorism countermeasures, including flares and dispensing systems.	STC
D.10cc	Automatic Dependent Surveillance-Broadcast (ADS-B). See: ADS-B Out System Guidance	
D.10dd	Radio Altimeter Systems	EVL
D.11	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

E. Changes to systems that affect aircraft airworthiness, such as:

Element	Description	Classification
E.1	Changes to an existing or installation of a new icing protection system.	STC
E.2	Changes to or relocation of exterior fuel vents, fuel drains, or battery vents. (Applicable to components not attached to the basic engine.)	ENG
E.3	Changes to crew or passenger LOX or onboard generating systems.	ENG
E.4	Changes to external, critical access doors, APU ram air, nacelle blowout doors, fuel drain.	ENG
E.5	Changes that include substituting rotor/airframe materials that affect structural integrity, lightning protection, or flight characteristics.	ENG
E.6	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
E.7	Changes to a critical or life-limited part, including engine/APU rotating parts.	STC
E.8	Changes of passenger-carrying aircraft to an all-cargo or combination configuration.	STC

Element	Description	Classification
E.9	Changes that may require a human factors compliance finding (for example, in flight deck instrumentation and controls).	STC
E.10	Changing or substituting engine/aircraft instrumentation required by a unique characteristic of the particular type design.	STC
E.11	Changes to rpm of main and tail rotor may affect handling performance characteristics and/or noise or acoustics.	STC

F. Changes to Oil, Hydraulic, Pneumatic, and Fuel Lines, or Systems or Their Components That Affect Their Operation or Installation and Flammability Requirements, Such as:

Element	Description	Classification
F.1	New types of hoses and/or hose fittings that may not meet installation requirements, such as those of flow rate and flammability.	ENG
F.2	New type of fuel dump valves.	ENG
F.3	New oil/fuel/hydraulic line materials.	ENG
F.4	New fuel tanks or fuel system components, including sealants.	STC

G. Changes in Fixed Fire Extinguisher or Detector Systems That Affect the System's Effectiveness or Reliability, Such as:

Element	Description	Classification
G.1	Relocating discharge nozzle, detector units, or fixed fire extinguisher bottles.	ENG
G.2	Using new or different detectors.	ENG
G.3	Decreasing the amount or changing the type of extinguishing agents.	ENG

H. Alterations or Repairs That Include:

Element	Description	Classification
H.1	Changes that include substituting airframe materials that affect structural integrity, lightning protection, HIRF protection, flight characteristics, or performance.	ENG
H.2	Use of synthetic covering materials.	ENG
H.3	Use of new titanium or magnesium applications.	ENG
H.4	Use of ceramic coatings.	ENG
H.5	Use of synthetic coatings.	ENG
H.6	Use of new plated coatings.	ENG

I. Crashworthiness.

Element	Description	Classification
I.1	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
I.2	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.

--Additional notes on next page--

NOTE: Seating configuration impacts the applicability of certain regulatory requirements (e.g. 14CFR 91.223, 91.609, 135.152, and 135.411).

See: Legal Interpretation Dukats, April 16, 2008
FAA Order 8900.1, V2C4S8

NOTE: Some seemingly minor changes, such as relocating an existing seat one inch, could have the effect 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.

NOTE: Complete initial interior installations require application for an STC or amended TC.

AFS-300 MAJOR REPAIR/ALTERATION DATA APPROVAL

ENGINES, PROPELLERS, AND APU

The following list applies to engines certificated under 14 CFR parts 33, 34, and 36 or JAR E, propellers certificated under14 CFR part 35 or JAR P, or APUs approved under TSO C77a or TSO C77b.

Click to select

Weight & Balance

Structural Strength

Reliability & Airworthiness

Components, Assemblies & Systems

Electrical Equipment

Emissions & Noise

Main Menu

AFS-300 MAJOR REPAIR/ALTERATION DATA APPROVAL

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.

A. Weight and Balance (W&B)

Element	Description	Classification
A.1	Changes that increase or decrease the certificated weight or CG.	STC

B. Structural Strength

Element	Description	Classification
B.1	Major type design changes to an engine, APU, or propeller's primary or critical structure.	STC

C. Reliability and Airworthiness

Element	Description	Classification
C.1	Changes to the approved ratings or operational or installation limits.	STC
C.2	Changes to the engine, propeller, or APU control system.	STC
C.3	Changes to engine, propeller, or APU adjustments and setting limitations that have an affect on power output or control functions or operability.	STC
C.4	Changes that alter the aerodynamic contour of any blades, vanes, or internal or external aerodynamic surfaces.	STC
C.5	Changes affecting engine or propeller performance, power, or rpm, including changes to inlet induction or exhaust components.	STC

D. Changes to Components, Assemblies, or Systems, Such as:

Element	Description	Classification
D.1	Relocation of fuel vents or drains.	STC
D.2	Adding new or using different type design alternators, generators, starters, vacuum pumps, or magnetos.	ENG
D.3	Adding new or using different type design hydraulic components, pumps, or turbo or superchargers.	ENG
D.4	Changing or relocating pressure fuel lines, oil lines and bleed-air lines.	ENG
D.5	External critical access doors, APU ram air, nacelle blowout doors, bleed ports and doors, and so forth.	STC
D.6	Installing new or modifying existing icing protection systems.	STC

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ENGINES, PROPELLERS, AND APU

Element	Description	Classification
D.7	Changes that include substituting engine/APU/propeller materials that affect structural integrity, lightning protection, operating characteristics, fire protection, or noise/acoustics.	STC
D.8	Major alterations to propellers.	STC
D.9	Changes to critical or life-limited parts.	STC
D.10	New propeller and engine combinations (vibration approval).	STC

E. Modification to Approved Electrical Equipment, Such as:

Element	Description	Classification
E.1	To design environmental performance standards.	STC
E.2	To the component manufacturer's specified operating limitations.	STC
E.3	Altering wiring, shielding or bonding that may adversely affect protection against HIRF, EMI, lightning diversion, or suppression.	STC
E.4	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
E.5	Changing or altering engine, propeller, or APU instrumentation.	ENG
E.6	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
E.7	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
E.8	Changes affecting the Airworthiness Limitations section (i.e., Chapter 4 or 5) of the ICAs.	STC

ENGINES, PROPELLERS, AND APU

Element	Description	Classification
E.9	Aircraft systems that directly connect to external services and networks under the following conditions: 1. The external service or network is non-governmental; 2. The aircraft system receives information from the non-governmental service or network; and, 3. The failure effect classification of the aircraft system is "major" or higher. See: Policy Statement AIR-21.16-02	STC

F. Other Considerations

Element	Description	Classification
F.1	Changes affecting exhaust emissions (part 34).	STC
F.2	Changes affecting engine noise (part 36).	STC

AFS-300 MAJOR REPAIR/ALTERATION DATA APPROVAL
LINKS TO SPECIFIC SYSTEM GUIDANCE AND INFORMATION

****

NOTE: This menu is not an all-inclusive list of applicable guidance. The applicable guidance is determined based on the particulars of each repair or alteration.

****

ADS-B

ELECTRONIC HORIZONTAL SITUATION INDICATOR (EHSI)

NIGHT VISION SYSTEMS

SATELLITE NAVIGATION SYSTEMS

TERRAIN AVOIDANCE & WARNING SYSTEMS

TRAFFIC & COLLISION AVOIDANCE SYSTEMS

ANGLE OF ATTACK POLICY MEMO

RETURN TO MAIN MENU

AFS-300 MAJOR REPAIR/ALTERATION DATA APPROVAL
SPECIFIC SYSTEM GUIDANCE

AUTOMATIC DEPENDENT SURVEILANCE-BROADCAST (ADS-B)

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

Overview

- Explains the requirements and limits for approval of installation instructions.

FAA Notice 8900.362, Policy for Installation of ADS-B OUT Systems

AC 20-165B, Airworthiness Approval of Automatic Dependent Surveillance- Broadcast OUT Systems

AFS-300 MAJOR REPAIR/ALTERATION DATA APPROVAL SPECIFIC SYSTEM GUIDANCE

ELECTRONIC HORIZONTAL SITUATION INDICATOR

****

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

****

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.

Technical Paper AFS-360-2014-1

AFS-300 MAJOR REPAIR/ALTERATION DATA APPROVAL SPECIFIC SYSTEM GUIDANCE

NIGHT VISION IMAGING SYSTEMS / NIGHT VISION GOGGLES

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NOTE: 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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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

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AFS-300 MAJOR REPAIR/ALTERATION DATA APPROVAL SPECIFIC SYSTEM GUIDANCE

SATELLITE NAVIGATION SYSTEMS

****

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

****

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.

Technical Paper AFS-360-2014-2
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

Technical Paper AFS-360-2014-5
Global Positioning System/Differential Global Positioning System - Special Use Applications

Other Satellite Navigation System guidance:

AC 20-138D
Airworthiness Approval of Positioning and Navigation Systems

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AFS-300 MAJOR REPAIR/ALTERATION DATA APPROVAL SPECIFIC SYSTEM GUIDANCE

TERRAIN AVOIDANCE AND WARNING

****

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

****

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

Technical paper AFS-360-2014-3
Follow-On Approval of Class B Terrain Awareness and Warning Systems (TAWS)

Technical paper AFS-360-2015-2
Field Approval of Helicopter Terrain Awareness and Warning Systems (HTAWS)

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

AC 27-1B
Certification of Normal Category Rotorcraft

AC 29-2C
Certification of Transport Category Rotorcraft

PREVIOUS VIEW

AFS-300 MAJOR REPAIR/ALTERATION DATA APPROVAL SPECIFIC SYSTEM GUIDANCE

TRAFFIC ADVISORY, ALERTING, AND AVOIDANCE

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

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.

Technical Paper AFS-360-2014-4
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 MAJOR REPAIR/ALTERATION DATA APPROVAL SPECIFIC SYSTEM GUIDANCE

ANGLE of ATTACK (AoA) INDICATOR

****

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

****

Overview

- Establishes requirements and procedures for issuing design and production approval for non-required/supplemental AoA systems.
- Explains the requirements and limits for approval of installation instructions.

AIR Policy Memo AIR100-14-110-PM01, Approval of Non-Required Angle of Attack (AoA) Indicator Systems.

Small Airplane Directorate Memo, May 8, 2014, Installation of non-required angle of attack (AOA) systems.

PREVIOUS VIEW

Federal Aviation Administration

Memorandum

Date: MAY 0 8 2014

To: Manager, Chicago Aircraft Certification Office, ACE-115

From: Manager, Small Airplane Directorate, ACE-100

Prepared by: Pete Rouse and Scott Fohrman

Subject: Installation of non-required angle of attack (AOA) systems.

Summary

This memorandum provides guidance on the requirements for Aircraft Certification (ACO) approval of installation instructions associated with non-required angle of attack (AOA) systems which have been granted production approval under AIR Policy Memo AIR100-14-110-PM01. The purpose of approving installation instructions associated with AIR Policy Memo AIR100-14-110-PM01 is to provide FAA Approved data to support a simple, and consistent, approach for the installation of non-required, supplemental AOA systems. The installation determination may be influenced by the aircraft's configuration. If the AOA system installation meets the criteria in the Installation Instruction Requirements section of this memorandum, the ACO approved installation data may be used to support the AOA system installation as either a major alteration or a minor alteration. A Major Change to type design is beyond the scope of this memo. This memo does not make the installation determination, as this is the responsibility of the certificated maintenance provider. It is necessary to clarify that the ACO is authorized to approve the installation instructions, the requirements for approving these instructions and the applicability of the installation instructions once approved. This policy is necessary to define and simplify the installation requirements and promote safety enhancing equipment, a long-standing FAA goal.

Applicability

This memo statement provides the ACO engineers with information on approving installation instructions associated with AIR Policy Memo AIR100-14-110-PM01 for non-required AOA systems on Normal, Utility, and Acrobatic Category airplanes operated under Title 14 of the Code of Federal Regulations (14 CFR) part 91 (not operating under part 91, subpart F or K).

These AOA systems have <u>not been determined to be suitable for operational credit</u> (reduced takeoff or landing distance requirements) or as a primary source of required stall warning information by the FAA. It does not apply to any airplane operator seeking to use an AOA system to replace required stall protection system.

Installation Instruction Requirements

In order to be eligible for ACO approval, installation instructions must be associated with a current AOA system production approval granted under AIR Policy Memo AIR100-14-110-PM01. In addition to the requirements of AIR Policy Memo AIR100-14-110-PM01, in order to be eligible for approval under this memorandum, the installation instructions must include the following requirements:

1. The following statement must be present:
   "These installation instructions are FAA Approved data to be utilized only for the installation of the AoA system described herein on aircraft certified under 14 CFR Part 23 (or predecessors). Provided all the requirements of section _____ of this document are met, no further FAA approval is required for the installation of this AoA system on a Part 23 Aircraft.

   If the limitations of section_____ are not met, further FAA approval may be required.

2. The document must include a unique document number, revision level and date.

3. A requirements section containing all the limits required by AIR Policy Memo AIR100-14-110-PM01 and the following.

Approved Installation Data Criteria:

1. The AOA system can be installed according to accepted practices and elementary operations.

2. The installation of the AOA system does not result in a change to the empty weight or empty balance which requires an increase in the maximum certificated weight or center of gravity limits of the aircraft.

3. The installation of the system is on an unpressurized aircraft:
   a. The installation of the AOA probe is in a location that does not interfere with the pitot-static system or aircraft stall warning system, and:
      i. On the wing:
         1. On an inspection panel, or is substituting for an inspection panel, on the underside of the wing provided that the probe is located where it does not interfere with the functioning of a primary flight control surface (aileron or spoiler).
      ii. On the fuselage:
         1. On an inspection panel, or is substituting for an inspection panel.
         2. On an area of the fuselage that would accommodate a like installation of an antenna, and is installed in accordance with

PREVIOUS VIEW

acceptable practices such as the aircraft maintenance manual or Advisory Circulars AC 43.13-1B and AC 43.13-2B.

b. The installation of the AOA probe pressure tubes, wiring, etc. do not require adding additional openings within the aircraft wing or fuselage primary structure.

c. The installation of the AOA indicator is:

i. In an existing opening in the instrument panel, or on the glareshield; or

ii. If an additional opening in the instrument panel is required to install the AOA indicator, the following requirements must be met:

1. The instrument panel cannot be part of the aircraft primary structure; or

2. If the instrument panel is part of the aircraft primary structure, the aircraft manufacturer's instructions must contain provisions for providing an additional opening within the instrument panel.

iii. In a manner in which the AOA indicator display does not interfere with the pilot's view of the primary flight instruments.

4. The AOA system may be installed on a pressurized aircraft, provided the installation meets the following criteria:

a. The installation of the AOA probe is in a location that does not interfere with the pitot-static system or aircraft stall warning system, and:

i. On the wing:

1. On an inspection panel, or is substituting for an inspection panel, on the underside of the wing provided that the probe is located where it does not interfere with the functioning of a primary flight control surface (aileron or spoiler).

ii. On the fuselage:

1. On an area of the fuselage in the unpressurized section on an inspection panel, or is substituting for an inspection panel.

2. On an area of the fuselage in the pressurized section that would accommodate a like installation of an antenna, provided the aircraft manufacturer's instructions must contain provisions for providing a mounting location.

b. The installation of the AOA probe pressure tubes, wiring, etc. do not require adding additional openings within the aircraft wing or fuselage primary structure and the AOA manufacturer's installation instructions must contain provisions for providing a means to install them into the pressure vessel.

c. The installation of the AOA indicator is:

i. In an existing opening in the instrument panel, or on the glareshield; or

ii. If an additional opening in the instrument panel is required to install the AOA indicator, the following requirements must be met:

1. The instrument panel cannot be part of the aircraft primary structure; or

2. If the instrument panel is part of the aircraft primary structure, the aircraft manufacturer's instructions must contain provisions for providing an additional opening within the instrument panel.

iii. In a manner in which the AOA indicator display does not interfere with the pilot's view of the primary flight instruments.

5. The AOA components located in the airstream do not exceed six square inches in frontal area.

6. The AOA system does not interface with the powerplant or its associated systems.

7. The system is non-required and used in an advisory or supplementary manner:
   a. There can be no changes to any aircraft operating limitations.
   b. There can be no changes to any aircraft operating procedures: Normal, Abnormal, and Emergency.
   c. There can be no performance credit taken for the AOA installation, such as reduced stall speeds, reduced approach speeds, reduced takeoff or landing distances, etc.

8. Accuracy of indication of stall must coincide with the stall horn, or be conservative (indicate stall at a higher airspeed) as compared to existing stall warning devices.

9. The installation of the AOA system does not interface with the pitot-static system.

10. The AOA system cannot be used as an input source to any automation or system that controls the aircraft, such as an autopilot or stick pusher unless done by STC.

11. If the AOA system provides an aural warning, it cannot be a source of nuisance warnings.

12. The electrical load requirements of the AOA system do not exceed 80 percent of the output load limits of the generator or alternator when operating in conjunction with the aircraft's required equipment.

13. All electrical wiring is installed in accordance with acceptable practices such as the aircraft maintenance manual, Advisory Circulars AC 43.13-1B and AC 43.13-2B or ASTM standards F2639, F2696 and F2799.

14. The calibration procedure must be simple, and repeatable. Calibration procedures, if done in flight, can be safely accomplished by a pilot of average skill, and any required maneuvers are contained within the Private Pilot Practical Test Standard.

15. The operating instructions for the AOA system are provided by the manufacturer. The operating instruction should be a separate document, rather than part of the installation instructions. The operating procedures should include the following items:
    a. Procedures for activating and deactivating the AOA system (ON/OFF).
    b. Procedures for recommended operations.
    c. Operational indications.
    d. Annunciations.
    e. AOA system failure mitigations.

NOTE: Any recommended procedures in the operating instructions should reference the applicable Pilot's Operating Handbook (POH) or Airplane Flight Manual (AFM).

16. The AOA manufacturer provides an evaluation of the effect of the AOA system installation on the airplane with regards to a major change in type design (per 14CFR 21.93), a major alteration or a minor alteration.

Aircraft Certification Office Evaluation

The ACO should review the AOA manufacturer's supplied data. If the manufacturers supplied data meets the criteria contained within this memo, the installation data may be approved by the ACO for an installer to use in either a major alteration or a minor alteration. The ACO approval of the installation data must include a statement that the installation data approval is only valid if it meets the criteria in the Installation Instruction Requirements section of this memorandum.

Installer Responsibilities

The installer must make the final determination of the AOA system installation requirements (major change in type design, a major alteration, or a minor alteration). The installation determination may be influenced by the aircraft's configuration. If the installer determines that the AOA system installation meets the criteria in the Installation Instruction Requirements section of this memorandum, the ACO approved installation data may be used to support the AOA system installation as a major alteration or a minor alteration. If the AOA system installation in a particular aircraft requires additional alteration data, outside of that contained within the manufacturers installation instructions, then the installer must make the final determination of the additional AOA system installation requirements (major change in type design, a major alteration or a minor alteration).

If you have any questions or need additional information, please contact:

Peter L. Rouse at 816-329-4135, or by email at Peter.Rouse@faa.gov

Scott Fohrman at 847-294-7136, or by e-mail at Scott.Fohrman@faa.gov.

Sincerely,

Earl Lawrence

Earl Lawrence
Manager, Small Airplane Directorate

TECHNICAL PAPER
AFS-360-2014-1
(Rev2a-04/14/2015)

FIELD APPROVAL OF ELECTRONIC HORIZONTAL SITUATION INDICATORS (EHSI)

1. PURPOSE: This paper consolidates guidance issued for Aviation Safety Inspectors (ASI) associated with the field approval of certain Electronic Horizontal Situation Indicators (EHSI).

2. REFERENCES:

a. FAA Order 8300.16, Major Repair and Alteration Data Approval -provides the policy for data approvals for major repairs and alterations.

b. Major Repair and Alteration Data Approval Job Aid - provides guidance applicable to other specific systems.

c. FAA AC 43-210, Standardized Procedures for Requesting Field Approval of Data, Major Alterations, and Repairs –provides standardized procedures for requesting field approval of data, major alterations, and repairs.

3. ACTION:

a. Field Approval Authority. ASIs are authorized to field approve aircraft alterations involving EHSI systems previously approved by type certificate (TC) or supplemental type certificate (STC) in a similar installation. ASIs are also authorized to review and approve associated Airplane Flight Manual Supplements (AFMS)/Rotorcraft Flight Manual Supplement (RFMS):

b. Conditions and Limitations.

(1) The EHSI must be installed in the same location and as a replacement for the existing instrument that most effectively indicates direction of flight.

(2) The EHSI wiring interconnects must be accomplished in accordance with the equipment manufacturer's documentation, (i.e., current installation manual, service bulletin, and service information letter).

(3) Interfaces with other equipment and systems for which the EHSI perform control functions, or display Terrain awareness and warning system (TAWS), weather data, traffic alert and collision avoidance system (TCAS), or other traffic information systems, must have prior approval or must be independently assessed by the applicant to determine if operating limitations need to be placed on the aircraft, or if any abnormal and emergency procedures, normal operating procedures, and aircraft performance are affected.

(4) The mechanical installation of the equipment must conform to the applicable airworthiness regulations and in accordance with the aircraft and equipment manufacturers' recommendations, observing acceptable methods, techniques, and practices. This would include but not be limited to instrument panel loading requirements.

(5) The display method, symbology and color must have prior approval.

(6) Cooling must be provided as described in the equipment manufacturers' requirements.

(7) An operational flight check must be conducted in Visual Flight Rules (VFR) conditions, to ensure the correct operation of all navigation devices interfaced to the EHSI. This operational flight check must include a full Instrument Landing System (ILS) auto pilot coupled approach if the aircraft is so equipped.

(8) Deviations requiring ACO Coordination.

- Interfaces with other equipment and systems not having prior approval.
- Changes made to the display method, symbology, or color.
- Changes in the EHSI mounting location.

Record of Revision

Date	Description
07/23/2014	Initial Release
09/22/2014	Remove Flight Manual Supplement signing authority paragraphs 3A and 3C.
02/03/2015	Reformat document
02/03/2015	Replace Flight Manual Supplement signing authority paragraph 3A
04/14/2015	Reformat document to Section 508 compliance

TECHNICAL PAPER
AFS-360-2014-2
(Rev 2a 04/15/2015)

FIELD APPROVAL OF GLOBAL POSITIONING SYSTEMS (GPS) OR GPS WITH WIDE AREA AUGMENTATION SYSTEMS (GPS-WAAS), ALSO REFERRED TO AS GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSS) EQUIPMENT

1. PURPOSE: This paper provides guidance for a qualified aviation safety inspector (ASI) to perform field approvals of the installation and operational use of global positioning system (GPS) or GPS with wide area augmentation system (GPS/WAAS) equipment.

2. REFERENCES:

a. FAA Order 8300.16, Major Repair and Alteration Data Approval - provides the policy for data approvals for major repairs and alterations.

b. Major Repair and Alteration Data Approval Job Aid - provides guidance applicable to other specific systems.

c. FAA Advisory Circular (AC) 20-138, Airworthiness Approval of Positioning and Navigation Systems - airworthiness approval of global navigation satellite system (GNSS) Equipment.

d. FAA AC 43-210, Standardized Procedures for Requesting Field Approval of Data, Major Alterations, and Repairs – provides standardized procedures for requesting field approval of data, major alterations, and repairs.

3. ACTION:

a. Field Approval Authority. ASIs are authorized to field approve GPS or GPS/WAAS alterations previously approved by a type certificate (TC) or supplemental type certificate (STC) in a similar installation. See the GPS/WAAS Alteration Decision Tree. ASIs are also authorized to review and approve associated Airplane Flight Manual Supplements (AFMS)/Rotorcraft Flight Manual Supplement (RFMS).

b. Conditions and Limitations.

(1) An alteration performed using data approved by TC or STC, installed in a different aircraft model and type, and similar to the initial TC or STC, may be eligible for field approval. The applicant must document the TC or STC number and the holder of the type design data, in addition to the work performed, and describe in block 8 of FAA Form 337 all deviations to, or differences from, the original TC or STC..

(2) The ASI performing a field approval determines, prior to issuance of a field approval, that both descriptive and substantiating data for the alteration, as submitted and declared in block 8 of FAA Form 337, is adequate, appropriate, and conforms to the aircraft intended to be altered. The ASI must verify the applicant's determination of compatibility of GPS or GPS/WAAS equipment with other equipment and systems as described in block 8 of FAA Form 337.

(3) The GPS/GNSS manufacturer has not, in most cases, evaluated compatibility with every autopilot or other interfaces that may be encountered during the original STC approval. Instead, the GPS/GNSS manufacturer tests a limited number of combinations for integration, and lists on their STC those deemed compatible. An evaluation must be performed to address system

compatibility where it has not been previously established. The installer must ensure that all considerations and applicable airworthiness standards have been addressed for installation and operation of the equipment or systems, including proper lateral and vertical coupling and in-flight performance of the autopilot.

(4) An alteration determined to be major may require an operational flight evaluation to verify performance integrity. Installations intended for IFR approved use may be initially limited to VFR use.

(5) The aircraft can be approved for return to service for IFR operations following successful completion of the required ground tests. However, the GPS or GPS-WAAS equipment cannot be approved for IFR use until the operational flight evaluation has been successfully accomplished.

(6) If it is determined that the performance integrity or mutual compatibility of the installed GPS or GPS/WAAS equipment cannot meet IFR requirements, the applicant must affix a placard in a position discernible by the pilot stating "Use of GPS (or GPS/ WAAS) not approved for IFR."

c. GPS/WAAS Alteration Decision Tree.

(1) The following decision trees provide guidance related to installing GPS/WAAS systems or upgrading existing GPS installations with WAAS capability and whether or not a field approval is appropriate. Installation specifics and the simplicity or complexity of a proposed alteration are the determining factors in a decision about whether or not a field approval is appropriate. The alteration's operational intent (i.e., the equipment's intended function) must be considered in the determination of approval method and level of substantiation necessary. To use the decision trees, begin at Figure 1 and follow the steps of the tree. You will be directed to Figures 2 and 3 as appropriate.

(2) The following definitions and discussion correspond to steps in the decision tree.

• Previously approved data – Refers to data used to substantiate an alteration on another aircraft via TC, amended type certificate (ATC), (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.

• 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.

• 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 – 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 Title 14 of the Code of Federal Regulation (14 CFR) Part 23 aircraft using Part 23 related data. 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 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 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 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.

d. Determining data applicability (Figure 3).

(1) How much or how little previously approved data applies to a particular installation depends upon how similar the proposed installation is to the original. The applicant must show that their data is applicable. General guidance to determine applicability includes:

• Whether the basis of certification of the aircraft to be altered is the same as, or equivalent to, the basis to which the original installation was certified.

• Whether there are significant differences in the on-board equipment or avionics suite.

• Whether there are significant differences in software function, and whether the equipment interfaces, data transfer busses, and intended functions are identical.

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

• 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.

• 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.

• Airworthiness Directives. Different airworthiness directives may be applicable to the new application than the original application.

• Equivalent Level of Safety Findings (ELOS). 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.

• 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.

(3) The interaction of other modifications must be addressed. The installation or upgrade of systems in Part 27 or Part 29 rotorcraft requires 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 unit may not be sufficient for rotorcraft. Testing to higher levels for environmental factors such as vibration, temperature, altitude and electromagnetic interference (EMI) radiation may be necessary compared to those for fixed wing aircraft.

(4) 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.

GPS/WAAS Decision Tree

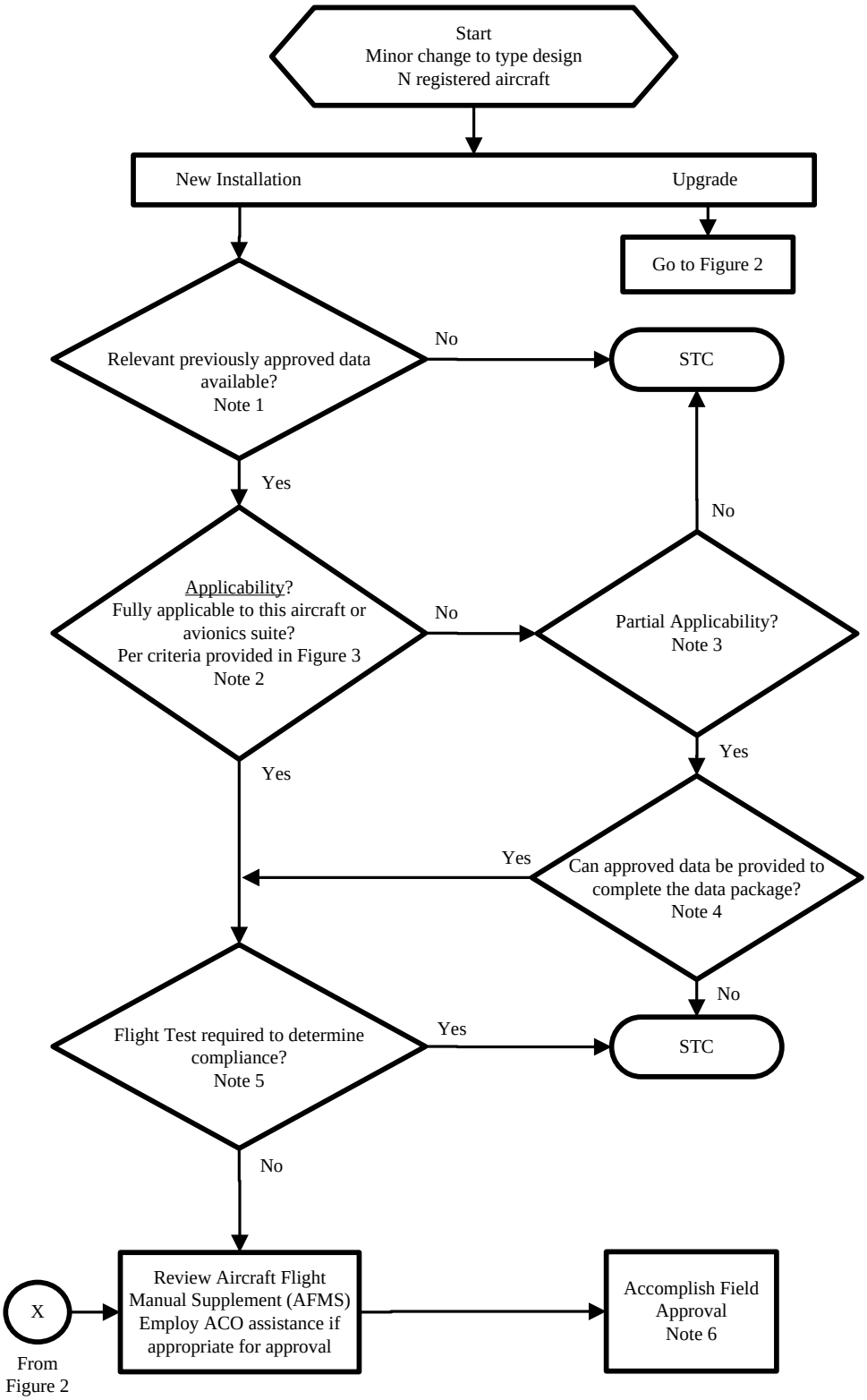

Figure 1. GPS/WAAS Decision Tree

PREVIOUS VIEW

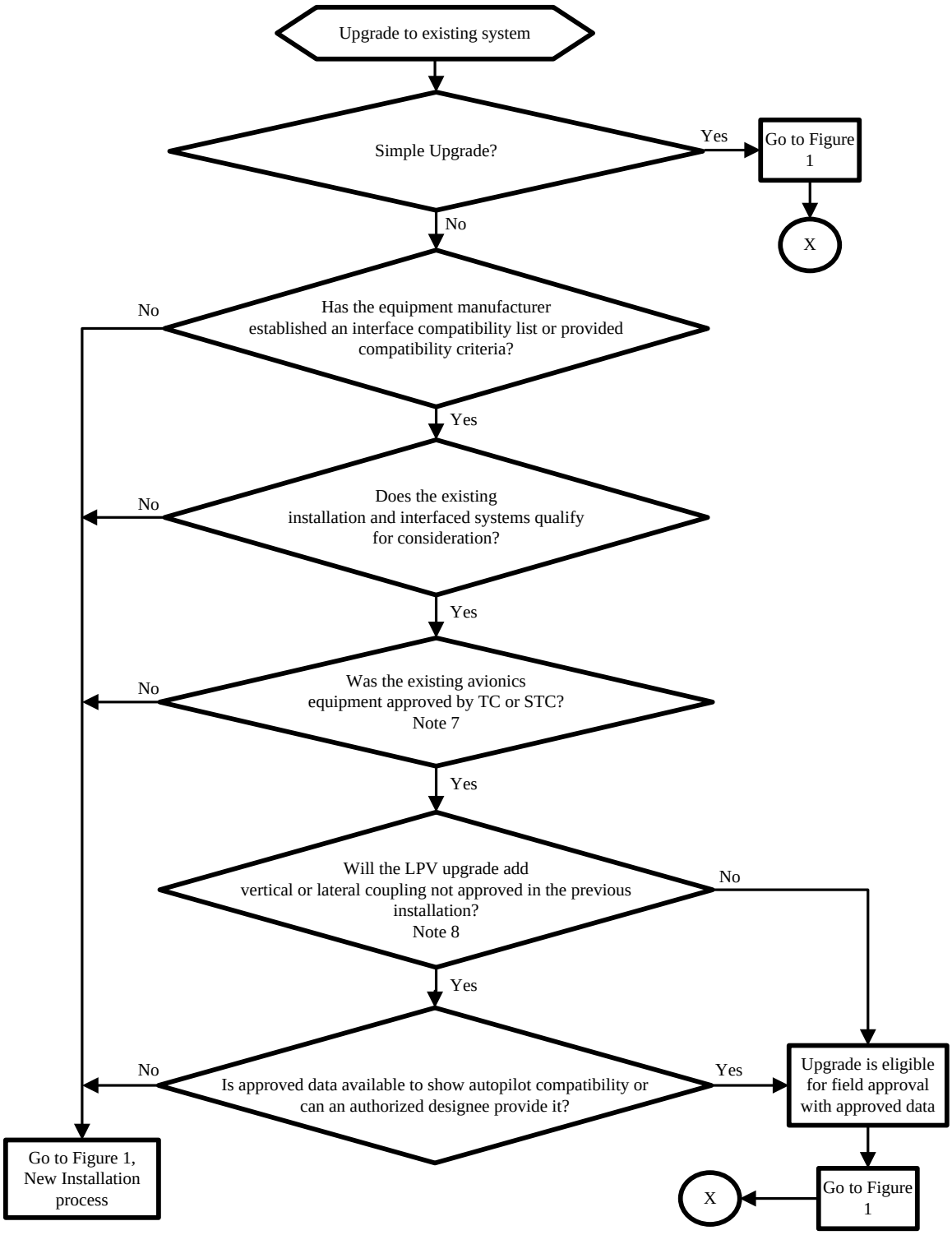

Figure 2. GPS/WAAS Decision Tree

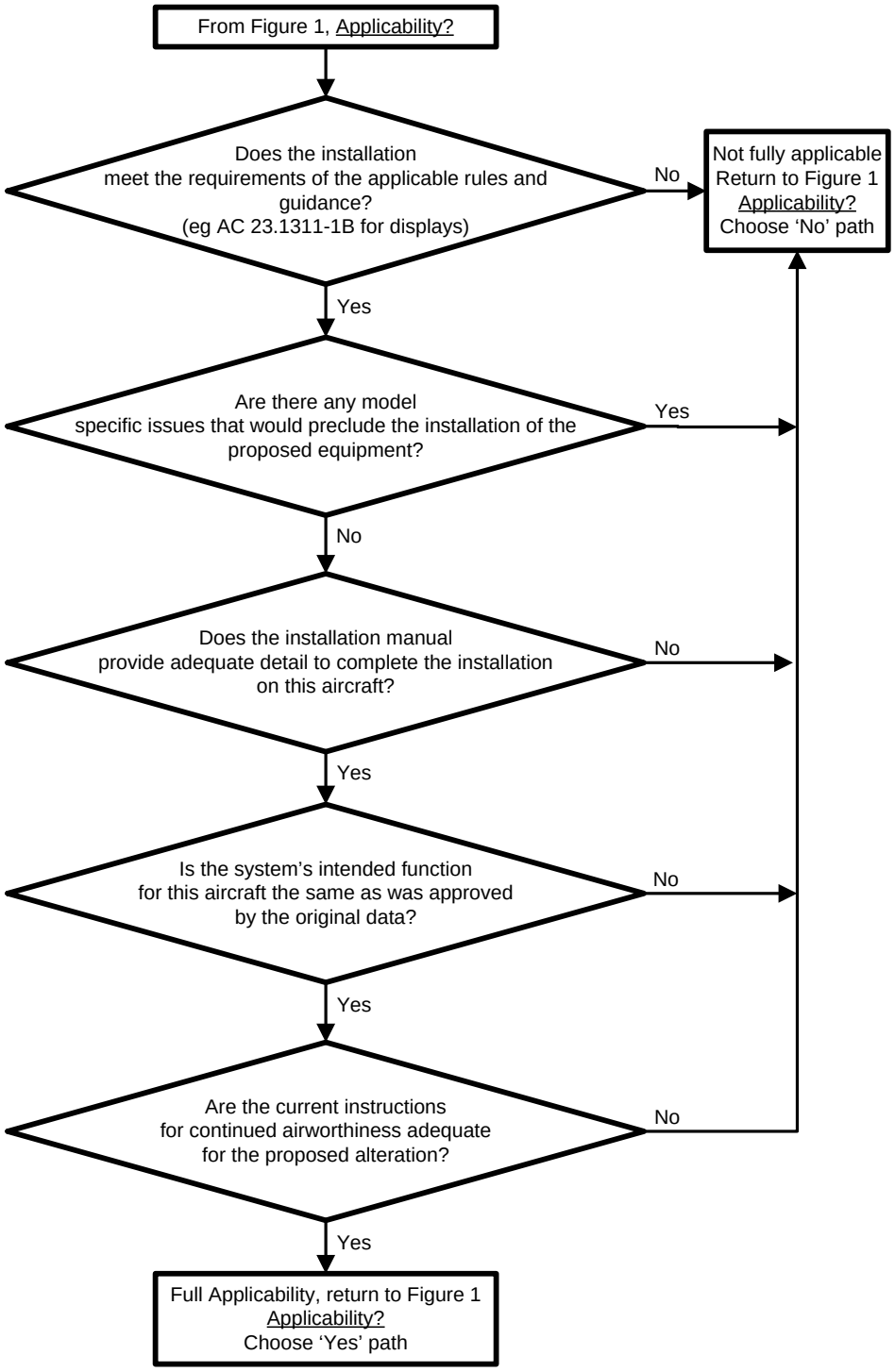

Figure 3. GPS/WAAS Decision Tree

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 FAA Order 8300.16.

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.

Record of Revision

Date	Description
07/23/2014	Initial Release
09/22/2014	Remove Flight Manual Supplement signing authority paragraphs 3A and 3C.
02/03/2015	Reformat document
02/03/2015	Replace Flight Manual Supplement signing authority paragraphs 3A.
04/15/2015	Reformat document to Section 508 compliance.

TECHNICAL PAPER
AFS-360-2014-3
(Rev 2a 04/15/2015)

FIELD APPROVAL OF CLASS B TERRAIN AWARENESS AND WARNING SYSTEMS (TAWS)

1. PURPOSE: This paper consolidates guidance issued for Aviation Safety Inspectors (ASI) associated with the field approval of Class B Terrain Awareness and Warning System (TAWS), also called an Enhanced Ground Proximity Warning System (EGPWS). See the Major Repair and Alteration Data Approval Job Aid for guidance applicable to other similar systems.

2. REFERENCES:

a. FAA Order 8300.16, Major Repair and Alteration Data Approval - provides the policy for data approvals for major repairs and alterations.
b. Major Repair and Alteration Data Approval Job Aid - provides guidance applicable to other specific systems.
c. FAA AC 43-210, Standardized Procedures for Requesting Field Approval of Data, Major Alterations, and Repairs - provides standardized procedures for requesting field approval of data, major alterations, and repairs.

3. ACTION:

a. Field Approval Authority. ASI are authorized to field approve TAWS Class B systems previously approved by a type certificate (TC) or supplemental type certificate (STC) in a similar installation. The previous approval does not have to involve the same model or type of aircraft, but should include a comparison of interfaces (sensors, displays, etc.) and operational characteristics. ASIs are also authorized to review and approve associated Airplane Flight Manual Supplements (AFMS)/Rotorcraft Flight Manual Supplement (RFMS):

b. Conditions and Limitations.

(1) The initial installation of TAWS equipment must have obtained airworthiness approval through the Type Certificate (TC) or Supplemental Type Certificate process. Aircraft eligible for follow-on approval must be certificated under Title 14 of the Code of Federal Regulations (14 CFR) parts 23, 25, 27, 29, or earlier Civil Aviation Regulation (CAR) counterparts, and operated under either part 91 or 135.

(2) The TAWS Class B equipment installed must comply with the minimum performance standards specified in TSO-C151a, Terrain Awareness and Warning System.

(3) Equipment installations that include functionality beyond the minimum TAWS Class B equipment requirements (e.g., terrain display; radio altimeter; landing gear; flap; or glide slope sensor inputs) are also eligible for follow-on field approval if previously included as part of the initial TC or STC and are incorporating the same interface. A more extensive installation evaluation and an operational flight check (described in 14 CFR §91.407) must be performed to ensure that the installation and equipment are compatible.

(4) If necessary, an FAA-conducted flight evaluation may be required to be performed to verify that the design and installation perform their intended functions and that there are no adverse interactions between the TAWS and existing aircraft systems.

NOTE: Flight evaluations will be conducted by the responsible Aircraft Certification Office (ACO) or, when authorized, by a Flight Test Pilot Designated Engineering Representative (DER) in accordance with the procedures used by the ACO.

(5) See advisory circular (AC) 23-18, Installation of Terrain Awareness and Warning System (TAWS) Approved for Part 23 Airplanes and (AC) 25-23, Airworthiness Criteria for the Installation Approval of a Terrain Awareness and Warning System (TAWS) for part 25 Airplanes, for further guidance on installation approval.

Record of Revision

Date	Description
07/23/2014	Initial Release
09/22/2014	Remove Flight Manual Supplement signing authority paragraphs 3A and 3C.
02/03/2015	Reformat document
02/03/2015	Replace Flight Manual Supplement signing authority paragraph 3A
04/15/2015	Reformat document to Section 508 compliance.

TECHNICAL PAPER
AFS-360-2014-4
(Rev2b 06/12/2015)

FIELD APPROVAL OF TRAFFIC COLLISION ALERTING DEVICE (TCAD), TRAFFIC ADVISORY SYSTEMS (TAS), AND TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEMS I (TCAS I)

1. PURPOSE: This paper consolidates guidance for a qualified aviation safety inspector (ASI) to perform field approvals of the installation of Traffic Collision Alerting Device (TCAD), Traffic Advisory Systems (TAS) as well as Traffic Alert and Collision Avoidance Systems class I (TCAS I), within aircraft operated under (14 CFR) part 91, 91 subpart K, 125, or 135.

2. REFERENCES:

a. FAA Order 8300.16, Major Repair and Alteration Data Approval - provides the policy for data approvals for major repairs and alterations.

b. Major Repair and Alteration Data Approval Job Aid - provides guidance applicable to other specific systems.

c. FAA Advisory Circular (AC) 20-138, Airworthiness Approval of Positioning and Navigation Systems – provides guidance concerning the airworthiness approval of global navigation satellite system (GNSS) Equipment.

d. FAA AC 43-210, Standardized Procedures for Requesting Field Approval of Data, Major Alterations, and Repairs – provides standardized procedures for requesting field approval of data, major alterations, and repairs.

3. ACTION:

a. Field Approval Authority. ASIs are authorized to field approve TCAS I, TCAD or TAS alterations previously approved by a type certificate (TC) or supplemental type certificate (STC) in a similar installation. ASI's are also authorized to review and approve associated Airplane Flight Manual Supplements (AFMS), Supplemental Aircraft Flight Manual (SAFM), or Rotorcraft Flight Manual Supplement (RFMS):

b. Conditions and Limitations.

(1) For piston-powered airplanes operated under 14 CFR part 125, 125.224, Aircraft Certification Office (ACO) concurrence is required if the system is intended to substitute for TCAS I or satisfy the criteria for "…equivalent to TSO C-118…," as noted in the "Collision Avoidance Systems" table in 125.224.

(2) For turbine- powered airplane with a seating configuration, excluding any pilot seat, of 10-30 seats operated under 14 CFR part 129, 129.18, ACO concurrence is required if the system is intended to substitute for TCAS I or satisfy the criteria for "…equivalent to excluding any TSO-C118…," as noted in the "Collision Avoidance Systems" table in 129.18.

4. **Flight Manual Supplement Approval.** The AFMS, SAFM, or RFMS must state that the TCAD, TAS, or TCAS I must be operated as a means supplemental to "See and Avoid" procedures.

NOTE: Systems designed with specific maximum altitude limitations may be installed into aircraft with higher certificated service ceilings than the limitation. The ASI authorized to perform field approvals must coordinate with their geographic ACO to facilitate review and approval of the proposed AFMS, SAFM, or RFMS, as appropriate.

Record of Revision

Date	Description
07/23/2014	Initial Release
09/22/2014	Remove Flight Manual Supplement signing authority paragraphs 3A and 3C.
02/03/2015	Reformat document
02/03/2015	Insert Paragraph 4 Flight Manual Supplement signing authority
04/15/2015	Reformat document to Section 508 compliance.
05/12/2015	Add TCAS I to paragraph 3a list (previously omitted by error)

TECHNICAL PAPER
AFS360-2014-5
(Rev1a 04/15/2015)

FIELD APPROVAL OF GLOBAL POSITIONING SYSTEMS FOR RESTRICTED CATEGORY AIRCRAFT USED IN "SPECIAL PURPOSE OPERATIONS"

1. PURPOSE: This paper consolidates guidance previously issued for Aviation Safety Inspectors (ASI) associated with the field approval of Global Positioning System (GPS) to be installed in aircraft used in special purpose operations. For the purposes of this section, "special purpose operations" includes:

- Agricultural (spraying, dusting, and seeding, and livestock and predatory animal control);
- Forest and wildlife conservation;
- Aerial surveying (photography, mapping, and oil and mineral exploration);
- Patrolling (pipelines, power lines, and canals);
- Weather control (cloud seeding);
- Aerial advertising (skywriting, banner towing, airborne signs and public address systems); and
- Any other operation specified by the [FAA].

2. REFERENCES:

a. Major Repair and Alteration Data Approval Job Aid - provides guidance applicable to other specific systems.

b. FAA AC 43-210, Standardized Procedures for Requesting Field Approval of Data, Major Alterations, and Repairs – provides standardized procedures for requesting field approval of data, major alterations, and repairs.

c. FAA Order 8300.16 Major Repair and Alteration Data Approval -provides the policy for data approvals for major repairs and alterations.

d. FAA Advisory Circular 20-138D Airworthiness Approval of Positioning and Navigation Systems –provides the policy for airworthiness approval of position and navigation systems.

3. ACTION:

a. Eligibility.

(1) Minor alterations require substantiation with data acceptable to the FAA therefore there is no need for field approval if the alteration is classified as minor, refer to Figure 3-1 of this document "Major and Minor Determinations Flowchart".

(2) Repairs and alterations that have all the necessary approved data do not require additional "approval." Such alterations may be documented on FAA Form 337 and submitted as described in FAA Order 8300.16.

(3) Major changes in type design are not eligible for field "approvals."

b. Field Approval Authority. Qualified ASIs are authorized to field approve GPS systems for "Special Purpose Operations", such as agricultural, aerial photography, mapping, firefighting, search and rescue, etc. where the only purpose of the installation is for the accurate sighting of the aircraft. These types of installations are considered non-essential and for special purpose use, therefore, the criteria for equipment performance are to be determined by the GPS equipment manufacturers. ASI's are also authorized to review and approve associated Airplane Flight Manual Supplements (AFMS)/Rotorcraft Flight Manual Supplement (RFMS):

c. Conditions and Limitations.

(1) Installers requesting field approvals and inspectors evaluating the data package must ensure that all information and referenced documents fully describe how the aircraft has been modified.

(2) The data package will include the installation, post-installation, and ground or functional flight checks recommended by the equipment manufacturer. References to Advisory Circular AC 43.13-1B and/or AC 43.13-2B and/or equivalent manufacturer's manuals must be specific and directly relevant.

(3) Duplication of previous approved data for an identical installation in a similar make and model aircraft is authorized provided the submitted FAA Form 337 contains a reference in block 8 identifying the FAA Form 337 it is basing its approval on and a copy of that form is provided.

(4) A placard, "GPS/DGPS" not to be used for navigation" must be placed in the cockpit in plain view of the pilot. Block 8 of FAA Form 337 must contain the statement that the aircraft has been placarded "GPS/DGPS" not to be used for navigation

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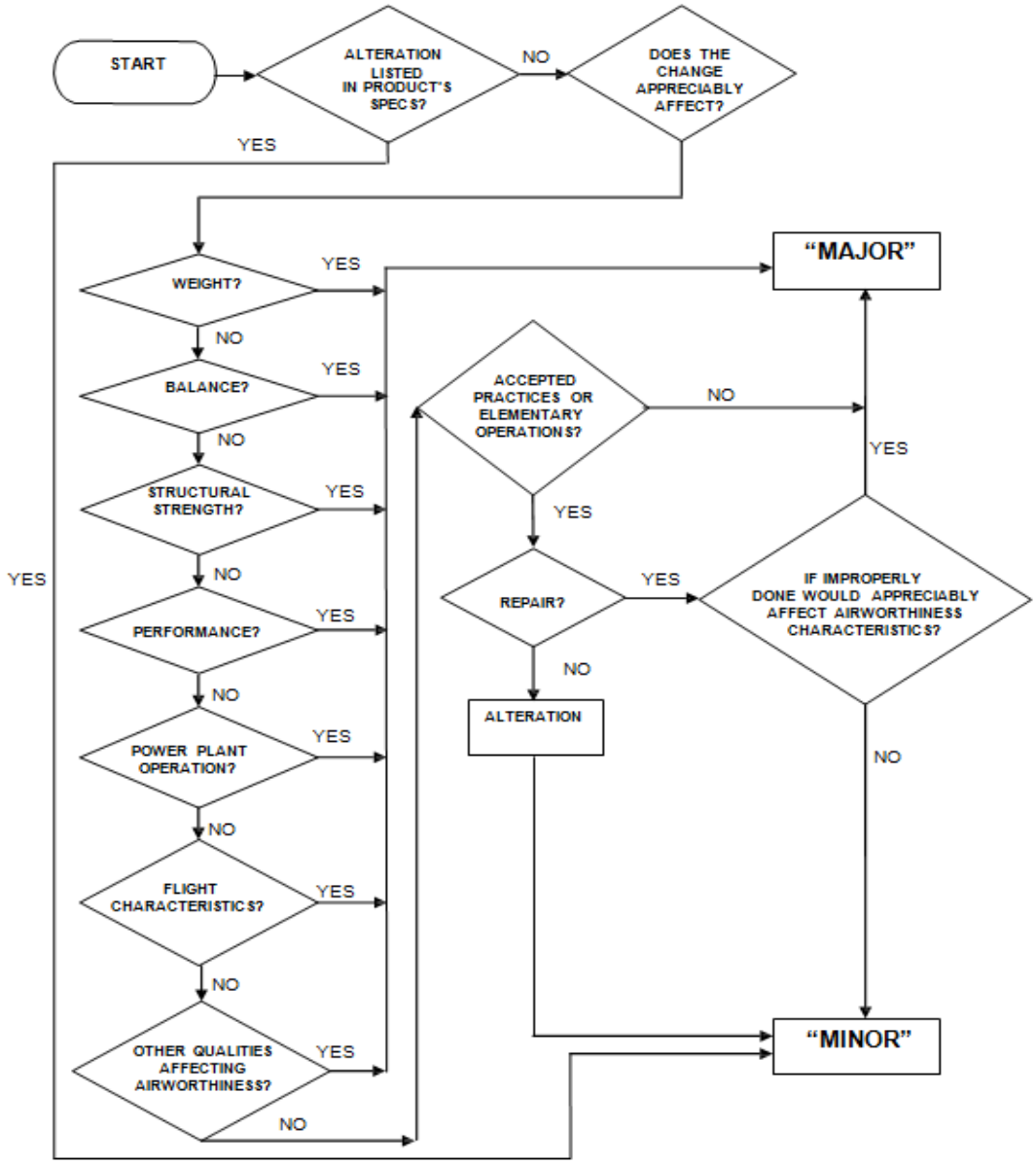
FIGURE 3-1
MAJOR AND MINOR DETERMINATIONS FLOWCHART



PREVIOUS VIEW

Record of Revision

Date	Description
07/23/2014	Initial Release
09/22/2014	Remove Flight Manual Supplement signing authority paragraphs 3A and 3C.and 3C.
02/05/2015	Reformat document
02/05/2015	Replace Flight Manual Supplement signing authority paragraph 3b
04/15/2015	Reformat document to Section 508 compliance.

PREVIOUS VIEW

TECHNICAL PAPER
AFS-360-2015-1
(Rev 0a 04/15/2015)

FIELD APPROVAL OF FLIGHT DATA MONITORING (FDM) SYSTEMS

1. PURPOSE: This paper consolidates guidance issued for Aviation Safety Inspectors (ASI) associated with the field approval of Flight Data Monitoring Systems (FDM). The level of FDM system installation complexity will determine if the installation is: a minor alteration requiring only a maintenance logbook entry, a major alteration requiring approved data and completion of FAA Form 337, or an amendment to a type certificate, supplemental type certificate, or an amendment to a supplemental type certificate.

2. REFERENCES:

a. FAA Order 8300.16, Major Repair and Alteration Data Approval – provides the policy for data approvals for major repairs and alterations.

b. Major Repair and Alteration Data Approval Job Aid – provides guidance applicable to other specific systems.

c. FAA Advisory Circular (AC) 27-1B MG 6, Certification of Normal Category Rotorcraft – provides guidance on FDM system design and installation to rotorcraft manufactures.

d. FAA AC 135-14B, Helicopter Air Ambulance Operations – provides guidance on FDM system design and operation to part 135 certificated operators.

e. FAA AC 43-210, Standardized Procedures for Requesting Field Approval of Data, Major Alterations, and Repairs – provides standardized procedures for requesting field approval of data, major alterations, and repairs.

3. ACTION:

a. Field Approval Authority. Aviation Safety Inspectors holding field approval authority are authorized to approve FDM system alteration data in accordance with the following conditions and limitations.

b. Conditions and Limitations.

(1) The applicant makes the assessment that the FDM system-

(a) Receives electrical power from the bus that provides the maximum reliability for operation without jeopardizing service to essential or emergency loads.

(b) Is installed such that it operates from the application of electrical power before takeoff until the removal of electrical power after termination of flight.

(c) Is capable of recording flight performance data to include, at a minimum, relative time and aircraft position, at a sampling rate of at least 1 sample per second.

(2) The operator adopts FDM system manufacturer instructions for continued airworthiness (e.g., the FDM system functional description, FDM system data readout procedures, maintenance activities, etc.).

(3) If an alteration is based on data approved by TC or STC in one aircraft type and model, installed in a different aircraft type and model that is similar to the initial TC or STC, may be eligible for field approval. The applicant must identify the original TC or STC number, in addition to the work performed, and describe the differences between the aircraft to be modified from the

aircraft listed in the original TC or STC in block 8 of FAA Form 337.

(4) The ASI performing a field approval determines that both descriptive and substantiating data for the alteration, as submitted and declared in block 8 of FAA Form 337, is adequate, appropriate, and conforms to the aircraft intended to be altered, prior to issuance of data approval.

Record of Revision

Date	Description
03/10/2015	Initial Release
04/15/2015	Reformat to Section 508 compliance

TECHNICAL PAPER
AFS-360-2015-2
(Rev0a 04/15/2015)

FIELD APPROVAL OF HELICOPTER TERRAIN AWARENESS AND WARNING SYSTEMS (HTAWS)

1. PURPOSE: This paper consolidates guidance previously issued for Aviation Safety Inspectors associated with the field approval of Helicopter Terrain Awareness and Warning Systems (HTAWS). See the Major Repair and Alteration Data Approval Job Aid for guidance applicable to other similar systems.

2. REFERENCES:

a. FAA Order 8300.16, Major Repair and Alteration Data Approval - provides the policy for data approvals for major repairs and alterations.

b. Major Repair and Alteration Data Approval Job Aid - provides guidance applicable to other specific systems.

c. FAA AC 43-210, Standardized Procedures for Requesting Field Approval of Data, Major Alterations, and Repairs – provides standardized procedures for requesting field approval of data, major alterations, and repairs.

3. ACTION:

a. Field Approval Authority. ASI are authorized to field approve HTAWS systems previously approved by a type certificate (TC) or supplemental type certificate (STC) in a similar installation. The previous approval does not have to involve the same model or type of Rotorcraft, but alteration data should include a comparison of interfaces (sensors, displays, etc.) and operational characteristics. ASIs are also authorized to review and approve associated Rotocraft Flight Manual Supplements (RFMS).

b. Conditions and Limitations.

(1) Initial installation of HTAWS equipment must have obtained airworthiness approval through the Type Certificate (TC) or Supplemental Type Certificate (STC) process. Rotorcraft eligible for follow-on approval must be certificated under Title 14 of the Code of Federal Regulations (14 CFR) parts 27, 29, or earlier Civil Aviation Regulation (CAR) counterparts, and operated under either part 91 or 135.

(2) The HTAWS equipment installed must comply with the minimum performance standards specified in TSO-C194, Helicopter Terrain Awareness and Warning System (HTAWS).

(3) Equipment installations that include functionality beyond the minimum HTAWS equipment requirements are also eligible for follow-on field approval if the additional functionality was previously included as part of the initial TC or STC.

(4) Interfaces to the HTAWS system (radar altimeter, remote annunciators) must

be of the manufacture type, model number, and part number kind as previously included as part of the initial TC or STC and must be integrated and configured in the same manner.

(5) The HTAWS display, which includes operating mode and alert annunciations and topical map of terrain & obstacle information must be located within +/- 15 degrees of the center of the ADI or Pilots instrument “T” if no ADI is installed.

(a) If the HTAWS display will not fit, then separate annunciations for warning, caution, status alerts and operating mode must be located within +/- 15 degrees of the center of the ADI or Pilots instrument “T” if no ADI is installed. The topical terrain & obstacle display can then be located within +/- 30 degrees of the pilot's center line of vision looking forward and within the pilot's reach.

(b) The display functions that depict the HTAWS annunciation and topical terrain & obstacle map information must meet the Major or Design Assurance Level (DAL) “C” as called out in the TSO installed performance requirements.

(6) Any remotely mounted HTAWS controls including alert acknowledgement and mode selection must be clearly labeled and located to prevent inadvertent operation. The HTAWS Fail or Inop annunciation must be installed such that it meets the Major or DAL “C” requirements called out in the TSO for unannunciated loss of HTAWS.

(7) Appropriate audio prioritization of the HTAWS Cautions and Warning in relation to the specific rotorcraft and its existing equipment should be properly addressed by the installer. I.E:

- Aircraft level warnings (such as low rotor rpm or master warning master caution)
- HTAWS (because the ground and obstacles won't move)
- TCAS and traffic systems (because the other aircraft can move, ie see and avoid)
- Aircraft Comm and Nav radios (because the call can always be repeated)
- Other aircraft audio systems such as entertainment systems (mp3 player)

(8) Some complications arise with the ability of the aircraft's audio system and its available inputs. It has been acceptable to have the HTWAS at the same audio level as the aircrafts warning systems so long as warnings such as low rotor rpm can be heard and understood with a simultaneous HTWAS call out.

(9) If the above stated criteria are not satisfied then it may be necessary for an FAA-conducted flight evaluation to be performed to verify that the design and installation perform their intended functions and that there are no adverse interactions between the HTAWS and existing aircraft systems.

NOTE: Flight evaluations will be conducted by the responsible Aircraft Certification Office (ACO) or, when authorized, by a Flight Test Pilot Designated Engineering Representative (DER) in accordance with the procedures used by the ACO.

(10) See advisory circular (AC) 27-1B, Certification of Normal Category Rotorcraft for Part 27 Rotorcraft, for further guidance on installation approval. Change 4 of the AC added Miscellaneous Guidance section MG-18 for HTAWS.

4. Flight Manual Supplement Approval.

a. The Avionics Inspector is authorized to review and approve RFMS based upon the content of the original supplement approved under TC or STC after ensuring the content is consistent with:

(1) The content of the basic RFM.

(2) The content of any applicant-furnished, FAA-approved RFMS or Supplemental RFM from the initial TC or STC, if applicable.

(3) The RFMS must contain the following Limitation information:

(a)Navigation must not be predicated upon the use of the HTAWS information. The terrain and obstacle display is intended to serve as a terrain and obstacle awareness tool only. The display and database may not provide the accuracy or fidelity on which to base routine navigation decisions and plan routes to avoid terrain or obstacles.

(b) The status of the inclusion of power lines in the obstacle database must be stated.

(c) Reduced protection mode must not be selected when operating under IMC conditions except as required when performing offshore platform IFR approach procedures or other special IFR procedures.

(4) The RFMS should contain the following information for Operational Considerations for Normal and Abnormal Procedures:

(a) Normal operating procedure to verify that the pilot can clearly hear HTAWS audio prior to flight.

(b) Terrain or Obstacle Caution Alert. When this alert occurs, verify the rotorcraft flight path and correct it, if required.

(b) Terrain or Obstacle Awareness Warning Alert. When this alert occurs, immediately initiate a maneuver that will provide maximum terrain or obstacle clearance, until all warning alerts cease.

(d) Inhibit. For those installations that include the ability to inhibit all or some of the HTAWS audio alerts, the RFM (or RFMS) should address:

- When should the audio inhibit function be used?
- What alerts are inhibited?
- How long the alerts are inhibited?
- How to re-establish the alerts?

5. Instructions for Continued Airworthiness Approval.

Instructions for Continued Airworthiness are required. In addition to standard ICA information, the ICA should state when and how the terrain and obstacle databases need to be updated.

Record of Revision

Date	Description
03/11/2015	Initial Release
04/15/2015	Reformat document to Section 508 compliance.

AFS-300 Major Repair / Alteration Data Approval 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:**

PREVIOUS VIEW

AFS-300 MAJOR REPAIR/ALTERATION DATA APPROVAL
Change Log

Change Log 6-15-2016

- Revised Text Transport Category element H.7
- Reformat document to comply with Section 508 Standards

Change Log 3-21-2016

- Replace missing header, Page 2, Introduction
- Remove note and link to FAA Only Reclassification Sharepoint Site, Page 7
- Add Outline letters to bookmarks for Engine Propellers and APU, Bookmark tab
- Remove Info Icon from D.9f, Page 30,
- Remove Info Icon from D10g, Page 42
- Add link to change log, Cover Page
- Remove Policy Memo from AFS360 Technical Paper page, Page 103
- Add Policy Memo/Statement page
- Add link to PS-ACE-23-08 on Policy Memo/Statement page
- Add note concerning PS-ACE-23-08 to D.13l, Page 19
- Add AVS-1 Memorandum, 03/02/2016, Installation approval for ADS-B Out systems to Policy Memo/Statement page
- Remove AFS-360-2015-3 technical paper (cancelled) and associated links
- Remove 10/10/2012 Memorandum, Installation Approval ADS-B, (cancelled) and associated links.
- Add info link to element 13bb to AVS-1 Memorandum, 03/02/2016, Page 21

Change Log 7-15-2015

- Revised text Transport Category element H.7
- Revised text Transport Category element H.7b
- Revised text Transport Category element H.8

Change Log 06-15-2015

- Add Technical paper, AFS-360-2015-3, ADS-B Installation
- Remove AFS-1 Memorandum and associated link
- Add Avionics line D10dd, Normal & Transport Category Rotorcraft, Radio Altimeter System
- Add Avionics line D.13a(1), Normal, Utility…Category, Cyber Security policy
- Add Avionics line D.9a(1), Transport Category, Cyber Security policy
- Add Avionics line D.10a(1), Normal & Transport Category Rotorcraft, Cyber Security policy
- Add line E.9, Engine, propeller…Category, Cyber Security policy
- Numerous format adjustments for Section 508 Accessibility requirements

Change Log 03-30-2015

- Revise/add links for reclassification requests
- Add link to PS-AIR-100-14-130-001, Bonded repairs in each category table
- Add H7, Changes to designs lithium batteries, Pt 25 table
- Add Links to information resources, lithium batteries

- Replace missing link to AC 25-571-1, Pt 25 B1
- Reformat all AFS-360 Technical papers, add change logs
- Revise Technical paper, AFMS eligibility statement
- Add Technical paper, AFS-360-2015-1, FDM installation
- Add Technical paper, AFS-360-2015-2, HTAWS

Change Log 10-27-2014

- Correct link on Eligibility Consideration page
- Add Small Airplane Directorate memo, Installation of non-required angle of attack indicators
- Update formatting and bookmarks

Change Log 10-20-2014

- Numerous non-technical format changes, installed missing page headers, added links to bookmarks, standardized titles to aid in searches, and etc.
- Remove AFS360-2014-1 Technical Paper
- Install AFS360-2014-1 Technical Paper, Rev1 07/22/2014
- Remove AFS360-2014-2 Technical Paper
- Install AFS360-2014-2 Technical Paper, Rev1 07/22/2014
- Remove AFS360-2014-3 Technical Paper
- Install AFS360-2014-3 Technical Paper, Rev1 07/22/2014
- Remove AFS360-2014-4 Technical Paper
- Install AFS360-2014-4 Technical Paper, Rev1 07/22/2014
- Remove AFS360-2014-5 Technical Paper
- Install AFS360-2014-5 Technical Paper, Rev1 07/22/2014
- Revise Eligibility Consideration For Field Approval
- Install Figure 1 Reclassification Review Process

Change Log 07-25-2014

- Change cover page to reference FAA 8300.16.
- Remove AFS-1 Memorandum and associated link
- Add paragraph E8g, Normal, Utility, Acrobatic, and Commuter Category Airplanes
- Add ACE-110 Memorandum, Installation of Vinyl Covering Shrink Wraps on the Exterior of Part 23 Airplanes, Gliders, and Airships
- Add paragraph 13cc, Normal, Utility, Acrobatic, and Commuter Category Airplanes
- Add policy memo AIR100-14-110-PM01
- Add editorial clarification, paragraph 13k, Normal, Utility, Acrobatic, and Commuter Category Airplanes
- Revise EHSI Guidance
- Remove FSAW 95-09E and associated link
- Add AFS360-2014-1 Technical Paper, Electronic Horizontal Situation Indicator (EHSI) Approvals
- Revise Satellite Navigation Guidance
- Remove FSAW 94-32C and associated link
- Add AFS360-2014-2 Technical Paper, 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

- Remove FSAW 94-41 and associated link
- Add AFS360-2014-5 Technical Paper, Global Positioning System/Differential Global Positioning System - Special Use Applications

- Remove FSAW97-09 and associated link
- Revise reference and associated link AC20-138C to AC20-138D
- Remove GPS/WAAS Field Approval Decision Process (see AFS360 Technical Paper) and associated link
- Revise Traffic System Guidance
- Remove FSAW98-04 and associated link
- Add AFS360-2014-4 Technical Paper, Field Approvals of Traffic Collision Alerting Device (TCAD), Traffic Advisory Systems (TAS), and Traffic Alert and Collision Avoidance Systems I (TCAS I)
- Revise Terrain Awareness and Warning Systems (TAWS) Guidance
- Remove FSAW 02-03a and associated link
- Add AFS360-2014-3 Technical Paper, Field Approval of Class B Terrain Awareness and Warning Systems (TAWS)