U.S. Department
of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Airworthiness Compliance Checklists Used to Substantiate Major Alterations for Small Airplanes

Date: 9/30/04
Initiated By: ACE-100

AC No: 23-21
Change:

1. PURPOSE.

a. This advisory circular (AC) provides guidance material for the creation and use of airworthiness compliance checklists that aid in substantiating requirements when performing major alterations to small airplanes. These checklists may be used by Airframe and Powerplant (A&P) mechanics and those holding Inspection Authorization (IA) privileges and by persons performing alterations (modifiers), under the privileges of an FAA Certificated Repair Station (CRS) operating under Title 14 Code of Federal Regulations (CFR) part 145 as well as by Federal Aviation Administration (FAA) Airworthiness Aviation Safety Inspectors (ASIs) to assist in determining that such alterations meet compliance with the Federal Aviation Regulations. These checklists will help identify all the data requirements and outline the data approval methods for a particular major alteration, as well as identify documentation required to further substantiate approval for returning the product to service.

b. Use of these compliance checklists should be limited to alterations that have been determined to be “major” alterations, as defined in 14 CFR part 1, and are not major changes to the type design of the product as denoted in 14 CFR part 21, § 21.97, and which are not so complex that they require a Supplemental Type Certificate (STC), per FAA Order 8300.10.

c. This AC is intended to aid persons performing an alteration using the guidance of AC 43-210, Standardized Procedures for Requesting Field Approval of Data, Major Alterations, and Repairs, as well as the ASI in determining requirements are met to satisfy airworthiness.

d. This AC does not change any previously released FAA guidance material such as FAA Orders and advisory circulars listed in section 4 of this AC. The intent of this AC is to provide an aid to assist industry and the FAA with existing approval processes.

e. Material in this AC is neither mandatory nor regulatory in nature and does not constitute a regulation. The use of these checklists during the return to service of a major alteration is not mandatory nor should it affect any previously acceptable method.

2. BACKGROUND.

a. The data and documentation requirements for major alterations vary considerably. This variation can be attributed to the following:

- Differing complexity of an alteration, e.g. degrees of equipment and systems integration
- Different sources and rigor of data submitted
- Uncertainty of what data is actually required to show compliance with applicable regulations as prepared to substantiate approval by FAA.

b. Standardization of data submission for alterations should be assured through the use of compliance checklists. The FAA will establish a library of compliance checklists that will be periodically updated. Such a resource will enable modifiers and ASIs to better evaluate regulatory compliance of a modification on similar makes and models of aircraft. For example, in the first case, the installation of a multi-function display as interfaced with a weather detection sensor and Terrain Awareness and Warning System (TAWS). You can access the library to see if a compliance checklist exists for the same change. If so, you use that checklist as a template for the creation of your checklist. Each checklist identifies the pertinent regulation as the certification basis of the airplane for the alteration. It also lists the manner in which the data can be approved.

c. This AC continues our commitment to improve the effectiveness and efficiency of the approval processes for major alterations by establishing an understanding of the needs and expectations of all parties involved. Reducing the time for applying for and receiving approval requires up front involvement between the FAA and the applicant to scope and plan the intended alteration project. Using a compliance checklist should result in a more effective use of FAA and industry resources by establishing more standard data and documentation criteria.

3. APPLICABILITY.

This AC applies to modifiers who use these airworthiness compliance checklists. These checklists are limited to use on small airplanes that have a maximum gross weight of 12,500 pounds or less. Individual checklist “limitations” section may have restrictions and limitations that are applicable to a specific alteration. Some possible examples would include: airplanes that weigh 6,000 pounds or less; non-pressurized airplanes only; or single, non-turbocharged engine airplanes; airplanes that are to be operated under Visual Flight Rules (VFR) only; or airplanes manufactured prior to a certain date. Specific applicability depends on the determination of the major alteration and the resultant effect on the aircraft to remain in compliance with 14 CFR, part 23 or CAR 3.

4. RELATED PUBLICATIONS.

a. Federal Regulations

CAR 3, Part 3 of the Civil Air Regulations as amended through March 25, 1964

CAR 4, Part 4 of the Civil Air Regulations as amended through March 25, 1964

14 CFR part 21 – Certification Procedures for Products and Parts

14 CFR part 23 – Airworthiness Standards: Normal, Utility, Acrobatic, and Commuter Category Airplanes

b. Orders

FAA Order 8110.37C, Designated Engineering Representative (DER) Guidance Handbook, dated 9/30/98

FAA Order 8110.45, Use of Data Approved by Designated Engineering Representatives to Support Major Alterations, dated 8/30/02

FAA Order 8300.10, Volume 2, Chapter 1 Performing Field Approvals, contained within the Airworthiness Inspector's Handbook, dated 6/30/04

c. ACs

AC 23-8B, Flight Test Guide for Certification of Part 23 Airplanes, dated 8/24/03

AC 23.1309-1C, Equipment, Systems, and Installations in Part 23 Airplanes, dated 3/12/99

AC 23.1311-1A, Installation of Electronic Displays in Part 23 Airplanes, dated 3/12/99

AC 43.9-1E, Instructions for Completion of FAA Form 337 (OMB No. 2120-0020), Major Repair and Alteration (Airframe, Powerplant, Propeller, or Appliance), dated 5/21/87

AC 43.13-1B, CHG 1, Acceptable Methods, Techniques, and Practices – Aircraft Inspection and Repair, dated 9/27/01

AC 43.13-2A, Acceptable Methods, Techniques, and Practices – Aircraft Alterations, dated 1/1/77

AC 43-210, Standardized Procedures for Requesting Field Approval of Data, Major Alterations, and Repairs, dated 2/17/04

Copies of the current publications of the Orders and ACs listed above can be obtained from the following address: U.S. Department of Transportation, Subsequent Distribution Office, Ardmore

East Business Center, 3341 Q 75th Avenue, Landover, MD 20785 or may be downloaded from the internet from the FAAs Regulatory and Guidance Library (RGL) at http://www.airweb.faa.gov/ac.

5. DEFINITIONS.

Aircraft Certification Office (ACO) – In the context of this AC, the ACO is the cognizant office responsible for the issuance of the TC, amended TC, or STC. Upon request an ACO provides engineering assistance to an ASI making field approvals, and reviews (and in some cases, approves) a final Aircraft Flight Manual Supplement (AFMS). An ACO may also be referred to as the Type Certificate Holding Office.

Approval for Return to Service – The approval given by an appropriately rated person that enables an aircraft to be returned to service following alterations.

Designated Engineering Representative (DER) – An FAA designated engineer who has been delegated a specific engineering discipline in which he can approve engineering data on behalf of the FAA.

Existing Certification Basis – The Type Certification Basis is the applicable rules and any additional requirements that the applicant must show and use, and what the FAA must find compliant in order to grant a type certificate.

FAA Form 337 (OMB Form No. 2120-0020) – An FAA form used to record a major repair or major alteration that becomes part of the maintenance record for the aircraft. Instructions for completing the Form 337 are contained within AC 43.9-1E.

Field Approval – Approval by an ASI of a major alteration or repair, documented on a completed FAA Form 337, Major Repair and Alteration (Airframe, Powerplant, Propeller, or Appliance), or equivalent form and in a manner acceptable to the Administrator. In the absence of approved data, such as for an installation of a hand control to substitute for rudder and brake application to satisfy the needs of paraplegic person, a field approval may be granted for an alteration or repair by physical inspection or testing.

Instructions for Continued Airworthiness (ICA) – The documentation that provides instruction on the maintenance of the airplane, engine, or propeller.

Major Repair – A repair that, if done improperly, might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics, or other qualities affecting airworthiness. A repair that is not completed according to accepted practices or cannot be made by elementary operations.

Major Alteration – An alteration not listed in the aircraft, aircraft engine, or propeller specification. An alteration that might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics, or other qualities affecting airworthiness, or an alteration that is not completed according to accepted practices or cannot be made by elementary operations, is considered a major alteration.

6. DOCUMENTS REQUIRED FOR OBTAINING FIELD APPROVAL.

The applicant should submit the following to their local Flight Standards District Office (FSDO):

- Completed FAA Form 337 with sufficient descriptive and detailed substantiating data to describe the alteration or repair

- Completed airworthiness compliance checklist containing applicable data

- Any other documentation required to describe limitations, emergency/abnormal procedures, normal operating procedures, performance, weight and balance, etc. such as would be contained within an Airplane Flight Manual Supplement (AFMS)

- Applicable ICAs. (New ICAs or revisions to ICAs, which contain Airworthiness Limitations Section (ALS) of the ICA, require FAA approval by and must be coordinated with the Aircraft Certification Office (ACO). See paragraph 7f for restrictions on establishing, altering, or canceling airworthiness limitations. Your submitted ICAs without ALS are only accepted by the FAA).

Individual airworthiness compliance checklists will have different data elements that are necessary to show compliance with the regulations. Also, some may require FAA ACO coordination for approval such as for approval of an AFMS, if otherwise not approvable by an ASI. This requirement depends on the alteration and will be conveyed on the checklist. Simple major alterations may not benefit from the use of a checklist when the applicant can show that the installation of equipment and system can be accomplished as a major alteration using approved data e.g. approved service bulletin, Airworthiness Directive (AD), STC, etc. This AC is not meant to imply that the use of these checklists are mandatory or impose the use of checklists in all cases, but it is meant to encourage their use.

7. GENERAL OVERVIEW.

a. The use of these compliance checklists should be limited to alterations that have been determined to be “major” alterations, as defined in 14 CFR, part 1, but are not so complex that they require an amended Type Certificate (TC) or STC per FAA Order 8300.10. Alterations that are classified as “minor” under 14 CFR, part 1, do not require the alteration be declared on an FAA Form 337, however the use of a compliance checklist would assist in making the determination that, in fact, the installation of all equipment, systems, and their components can be installed as a minor alteration. The first step in considering using these compliance checklists is making the determination that the major alteration is one that does not require an STC.

b. The next step is to determine the aircraft’s certification basis, which will provide the amendment level of 14 CFR, part 23 (or predecessor Civil Aviation Regulation (CAR) 3, Bulletin 7, etc.). The alteration must show compliance to all applicable regulations at that amendment level. The certification basis of the airplane is found on the airplane’s Type Certificate Data Sheet (TCDS). The TCDS is the controlling document for an airplane, its model number and serial number. The TCDS can be found online at http://www.airweb.faa.gov/rgl.

You need to know the certification basis in order to complete the checklist form in the correct manner. The major alteration may be completed to a certification basis by applying later amendments of the regulations than the existing ones specified in the TCDS for the aircraft at the time of its initial certification.

c. The next step is to determine what data is required by the FAA to approve the major alteration as declared in Item (Block) 8 of the submitted FAA Form 337. Both descriptive and substantiating data must be provided in sufficient detail to describe the installation. A DER, FSDO ASI, or an ACO engineer can approve data. The "approval" methods of this data determine how the checklist is to be completed. The analysis and the flexibility of data approval methods depicted on the checklist illustrate the value in using these checklists during the job planning stages. For example, you may determine several compliance requirements for the installation of electrical equipment components, structural, wiring, antenna, or the associated electrical load analysis which is performed. You may possess approved data for the installation of the electrical equipment components and the antenna from the manufacturer, for example, you may use AC 43.13-1B as acceptable data for the wire type and gauge qualification, and you may use a DER to complete the approved data for electrical loads analysis. The checklist defines the contents of the data package and illustrates all items to be included within it.

d. One of the methods of obtaining approved data for a particular alteration is to utilize a DER to provide necessary approved data. This methodology is described in FAA Order 8110.45, "Use of Data Approved by Designated Engineering Representatives to Support Major Alteration," dated 8/30/02; and Order 8110.37C, "Designated Engineering Representative (DER) Guidance Handbook," dated 9/30/98. Both Orders can be found at the FAA website http://www.faa.gov. When you identify a requirement for data during an alteration, you may contact a DER with the authority, as listed in Order 8110.37C, to generate the report and submit approved data. The use of a DER to develop FAA approved data can save time because it is an efficient means to ensure completeness of the required data. When contacting a DER, only DERs specifically authorized by their managing ACO are permitted to approve data for major repairs and alterations.

e. If you use a DER(s) to develop and approve data, you may receive feedback from the DER(s) regarding additional data requirements. For example, if you have contracted for an electrical DER to accomplish an electrical loads analysis, and he or she notices the need for, and recommends a structural review of the equipment installation, you should take that recommendation into consideration and include it as an additional checklist requirement.

f. Neither the DER nor an ASI has the authority to establish, alter, or cancel the FAA approved airworthiness limitations contained in the ALS of an approved ICA. Only the product manufacturer has the authority to establish or alter the ALS and only the ACO can approve the ALS.

8. HOW TO CREATE AND USE AIRWORTHINESS COMPLIANCE CHECKLISTS.

This section describes how to use, and provides instructions for completing each section of the airworthiness compliance checklist. Each checklist lists the pertinent regulation at the

existing certification basis of the airplane at the time the alteration is performed. It also shows the manner or method by which the data can be approved.

Each checklist is formatted with the same paragraphs with information specific to the particular alteration and with data specifically pertinent to that individual checklist. A discussion regarding each paragraph of a typical checklist found in the appendices is as follows:

a. Paragraph 'a' of Checklist. The first page of each checklist is the table, which provides a means to show compliance to the applicable regulations associated with the major alteration to be accomplished. The compliance table contains the following:

(1) Title Block. The title has a brief description of the major alteration to be accomplished. The title block contains information about the aircraft: Make, Model, and Serial Number blocks will be found on the aircraft manufacturer's identification plate. The Registration Number is the same as shown on FAA Form 8050-3, Certificate of Aircraft Registration (N - number). The title block also contains the Statement of Applicability to be signed by the IA or a representative of the CRS, and states "I have determined the planned alteration to be in compliance with paragraph 'c', "checklist applicability"." The intent is to have the IA or the CRS evaluate the aircraft and proposed alteration to determine if the use of the checklist is appropriate. The IA or CRS accomplishes this by evaluating the applicability requirements defined in paragraph c of the checklist.

(2) The Body of the Compliance Table. The table outlines the applicable regulations, which need to be complied with, and the methods for showing compliance. The table contains eleven columns. The first four columns are used to show methods of compliance and completeness of compliance for the required line item as follows:

(a) Column 1 is titled "Item Completed Initials". This column is used primarily by the applicant for initialing the completeness of that particular line item. When column 1 is completed and all the line items are initialed, the checklist is complete.

(b) Columns 2, 3, and 4, "Planned FAA Approval Method" are used to indicate the data approval method. These columns are used during the planning stages of the alteration. The applicant will make selections for a planned data approval method for each line item in the table by checking the box in column 2, or 3, or by writing descriptions of data in column 4. Column 2 is labeled "DER, 8110-3." The box in this column will be selected, if for that line item compliance will be documented on an FAA Form 8110-3 from a DER. Column 3 is labeled "FSDO/ASI, 337 Block 3." The box in column 3 will be selected if it is intended that the ASI will approve the data in this line item. This is commonly accomplished by coordination between the modifier and the ASI during planning stages. If the column 3 box is selected, Block 3 of FAA Form 337 must be completed and signed by the ASI. Column 4 is titled "Other". This column will be used when data approval is to be accomplished by means other than the use of an FAA Form 8110-3 with DERs signatures or by having the IA or CRS approve the data by signing Block 3 of the FAA Form 337. When using this column, enter the intended approval method. Some typical examples would include using a specified chapter and paragraph of AC 43.13-1B, STCs, or approved structural repair manuals.

(c) Column 5 is titled "Subject Evaluated." This column contains a brief description of the engineering subject matter, which requires approved data to show compliance to the regulatory requirement of that particular line item.

(d) Columns 6 and 7 are titled "14 CFR or CAR 3". Each of these columns lists the applicable 14 CFR or CAR 3 requirement that is associated with the certification basis of the airplane to find compliance for that particular line item. The determination of which column to select between "14 CFR" and "CAR 3" relates to the date of the initial or original the certification for the airplane. If your aircraft has a certification basis other than 14 CFR, part 23 or CAR 3, such as CAR 4 or Bulletin 7, indicate as such in column 7 per tables 1-1, 2-1, 3-1, 4-1, and 5-1, note 5 in the tables. For example, if the aircraft had a certification date prior to 1966 (the initial date for part 23), you would select the CAR 3 column. The amendment level of part 23 at which each sub part was amended is listed next to the part. The requirement is to show compliance to the appropriate amendment for the existing certification basis of your airplane. For example, if your airplane's certification basis is 14 CFR, part 23, amendment 37, and the checklists identify a line item "14 CFR, part 23, § 23.301, N, 28, 42, 48" you are required to show compliance to 14 CFR part 23, § 23.301, as written in amendment 23-28. Amendments 42 and 48, which may be more stringent are not applicable to your aircraft when using this checklist. In this example, you would circle the "28" and show compliance by using column 2-4, as required. Note: There may be times when compliance with the most recent amendment would be desirable to satisfy certain operational conditions, or in order to comply with special conditions or other requirement to mitigate safety risk.

(e) Column 8 is titled "Items to Consider or Intent of the Regulation". This column contains examples of the items under which regulatory compliance of the particular line item is identified.

(f) Column 9 is titled "DER Authority". This column identifies the specific DER authority delegated to him or her to execute the FAA Form 8110-3 "Statement of Compliance with the Federal Aviation Regulations" for the respective approval basis. These authorities are identified within Order 8110.37, as amended. A DER may also be required to have the authority delegated to him or her by the cognizant Aircraft Certification Office in order to perform different functions than those identified in Order 8110.37, as amended. If eligible, the respective DER must indicate additional authorized functions in paragraph 'h' of Table 1-1 of the checklist.

(g) Column 10 is titled, "Other Guidance". Listed here are other sources of information, ACs or Orders that may help in preparation.

b. Checklist Table. The Checklist Table is a description of checklist intent.

c. Approval, Paragraph 'c' of Checklist. Alterations meeting the scope described in paragraph c may be approved by using this checklist and completing the FAA Form 337. The IA can approve this alteration and the airplane incorporating it for return to service using DER data by completing Block 7, "Approval for Return to Service," of FAA Form 337. The FAA usage of Block 3, "For FAA Use Only," will not be required to accomplish this checklist for alterations

that fall within the scope of paragraph ‘c’, providing that no data approval is required by AFS/ASI.

d. Airworthiness Compliance Checklist Applicability, Paragraph ‘d’ of Checklist.

(1) This paragraph stipulates all the limitations and restrictions of the usage of the checklist. The following limitations, restrictions, and requirements are common to all checklists:

(a) Checklists do not add to or detract from any existing FAA regulations. Some installations may have additional regulatory requirements beyond those listed below. An alteration cannot override an AD. If an alteration affects an AD, contact the FSDO or ACO for assistance.

(b) A foreign country may require more documentation of airworthiness than a copy of the FAA Form 337 before it will license an airplane that has been altered with DER data or via the field approval method. The nature and amount of additional documentation required depends upon the terms of the bilateral agreement between the United States and the importing country. Consult the applicable bilateral agreement and comply with its terms before exporting an altered airplane. Refer any questions regarding compliance with a bilateral agreement to your local Manufacturing Inspection District Office (MIDO).

(c) Alterations must be compatible with previous alterations and the current configuration.

(d) Checklists for alterations requiring revision of the FAA approved limitations section of the Aircraft Flight Manual (AFM) or Flight Manual Supplement (FMS) require ACO coordination (reference 14 CFR, part 23, §§ 23.1581 through 23.1589).

(e) Checklists that require changes to the ALS of the Instructions for Continued Airworthiness, as described by 14 CFR, require ACO coordination for approval.

(2) Other restrictions or limitations applicable to the individual alteration are stipulated. One example would be the following:

This checklist is to be used only on the following:

(a) Airplanes of 6,000 pounds or less maximum gross weight,

(b) Airplanes having a single, naturally aspirated reciprocating piston engine,

(c) Unpressurized airplanes.

e. Checklist Use, Paragraph ‘e’ of Checklist. In this paragraph specific installation instructions, installation requirements, continued airworthiness requirements, and inspections are outlined. Discussion is provided regarding specific engineering examination requirements, installation limitations, and any ICAs required. Specific engineering support data required for

the alteration is outlined in detail. Specific installation requirements, specific things to watch out for, are outlined, and any specific instructions for continued airworthiness are stipulated. For example:

(1) If adding or relocating equipment, specific installation requirements should be stipulated in this section.

(2) Appropriate operations advisory information should be included in the AFM/FMS.

(3) Installation must comply with installation instructions and limitations from the component manufacturer.

(4) Any additional ICAs are properly documented per 14 CFR, part 23, § 23.1529, requirements.

f. Necessary Approvals, Paragraph 'f' of Checklist. This paragraph specifies the necessary approvals to complete the checklist and where on the checklist to indicate the approvals. Specific sections of the tables will be filled out by DERs, CRSs, A&Ps, and/or IAs.

g. Applicable Guidance Material, Paragraph 'g' of Checklist. This paragraph allows for additional applicable guidance material to be added to the checklist.

h. Evidence of DER Authority to Approve, Paragraph 'h' of Checklist. This paragraph provides an opportunity for a DER to present his authority to sign and approve a particular engineering discipline that has been presented to him in a manner other than in accordance with FAA Order 8110.37.

i. Complete Checklist Process. Send a copy of the completed checklist and supporting data to the local FSDO office which will, in turn, forward it to the FAA Aircraft Registration Branch, Oklahoma City, Oklahoma, for inclusion in the aircraft record. Submit originals to the aircraft owner or operator to be kept with the aircraft records.

9. BENEFITS. The benefits of using the airworthiness compliance checklist during return to service of specific alterations on small airplanes are numerous:

a. The data package requirements for submittal to the FAA are known.

b. A specific list of all necessary data requirements and means of obtaining FAA approval is stipulated.

c. The overall benefit to the applicant and the FAA is the standardization of requirements for a particular small airplane alteration and a more predictable, streamlined FAA approval process. The use of the airworthiness compliance checklists will eliminate the need to recreate repetitively, from scratch, similar applicable airworthiness requirements.

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APPENDIX 1

AIRWORTHINESS COMPLIANCE CHECKLIST #1: INSTALLATION OF APPROVED BELT DRIVEN GENERATORS AND ALTERNATORS

a. I have determined the planned alteration to be in compliance with paragraph d, checklist applicability.

IA SIGNATURE _____ DATE _____

AIRCRAFT MAKE _____ MODEL _____

SERIAL # _____ N# _____

CERTIFICATION BASIS DATE ON TDCS _____

TABLE 1-1. Installation of Approved Belt Driven Generators and Alternators - Checklist Qualifications for DER Data Review

Item [1] Completed Initials	Planned FAA Approval Method Pick 1, [2] DER 8110-3	FSDO ASI, 337, Block 3	Other (AC 43.13)	Subject Evaluated	(14 CFR) [4]	(CAR 3) [5]	Item to Consider or Intent of the regulation	DER Authority [3] (ref. 8110.37	Other Guidance AC Orders Policy	AC 43-13-1B/2A
				Design and Construction, General	23.601 *N*	3.291	• Determine suitability of each component on safety of essential systems. • Alternator type, belt type etc., must be suitable for the aircraft and its intended operation.			
				Materials and Workmanship	23.603 *N, 17, 23*	3.292	• All materials must meet suitable specifications.			
				Inspection Provisions [4]	23.611 *N, 7, 48*	3.296	• Inspection and servicing must be accomplished in an appropriate manner. • Are reasonable means provided for inspection and servicing.			
				Powerplant Accessories	23.1153 *N, 14, 29, 34, 42*	3.635	• Approved for mounting. • Use provisions for mounting. • Electrical sparking contact with flammable fluids or vapors mist minimized. • Continued rotation during a malfunction, if hazardous, must have a means to prevent rotation without interfering with the continued operation of the engine.			
				Function and Installation	23.1301 *N, 7, 14, 20*	3.651	• Additional equipment installed (per operating rules) must meet intended function.			

TABLE 1-1. Installation of Approved Belt Driven Generators and Alternators - Checklist Qualifications for DER Data Review (continued)

Item [1]	Planned FAA Approval Method Pick 1, [2]			Subject Evaluated	Item to Consider or Intent of the regulation		DER Authority [3] (ref. 8110.37	Other Guidance	
Completed Initials	DER 8110-3	FSDO ASI, 337, Block 3	Other (AC 43.13)		(14 CFR) [4]	(CAR 3) [5]		AC Orders Policy	AC 43-13-1B/2A
				Hazard Assessments	23.1309 *14, 17, 34, 41, 49*	3.652, 3.681	• May not interfere with operation of equipment essential to safe operation, or other equipment unless there is a means to inform pilot. • Examine electrical system, charging and distribution separately and in relation to other systems, warning, engine instruments, etc. • All equipment determined as essential must be taken into account in the load analysis. • Must be labeled as to identity, function, operation, operational limits, or any combination thereof.			
				Warning Lights	23.1322 17, 43		**AMBER:** Caution lights (lights indicating the possible need for future corrective action.)			
				System Reverse Current Cutout	23.1351 *N, 7, 14, 17, 20, 34*	3.690, 3.693 3.687	• Alternator and associated transmission cable must be rated for the loads applied to the electrical system in probable combinations and durations. • Reverse current cutout will not allow the battery to drain if alternator fails.		Loads analysis AC or MIL spec or may apply all equipment and current from alternator.	
				Circuit Protective Devices	23.1357 *N, 20, 43*	3.690, 3.691	• If fused, must carry a spare fuse. • Must be locatable and identifiable in flight for reset or replacement.			

TABLE 1-1. Installation of Approved Belt Driven Generators and Alternators - Checklist Qualifications for DER Data Review (continued)

Item [1] Completed Initials	Planned FAA Approval Method Pick 1, [2] DER 8110-3	FSDO ASI, 337, Block 3	Other (AC 43.13)	Subject Evaluated	(14 CFR) [4]	(CAR 3) [5]	Item to Consider or Intent of the regulation	DER Authority [3] (ref. 8110.37	Other Guidance AC Orders Policy	AC 43-13-1B/2A
				Master Switch	23.1361 *N, 20, 43, 49*	3.688, 3.689	• Master switch arrangement shall be provided which will disconnect all sources of electrical power from the main distribution system at a point adjacent to the power sources. • Master switch will be easily discernable			
				Switches	23.1367 *N*	3.694	• All switches must be capable of handling the required current. • Constructed with enough distance or insulating material between parts and housing so that vibration is not a problem. • Accessible to appropriate flight crewmembers. • Labeled as to operation and the circuit controlled.			
				Instruction for Continued Airworthiness	23.1529 *N*		• Must include procedures for removal and installation from aircraft (i.e. exploded view, wiring diagrams, etc.). • Special tools required. • Encouraged to include required inspection interval. • May include repair of equipment component if not on replace as required basis. Equipment OEM manuals are encouraged but not alone acceptable.			

[1] IA should enter initials to indicate items that have been completed. In some cases items may be left open pending final FSDO/ASI signature in Block 3 of FAA Form 337.

[2] These findings can be made by a FSDO inspector, ACO engineer or DER. When FSDO inspector approves an item they must also sign Block 3 of FAA Form 337.

[3] Or other equivalent authority, as evident on this form per DER.

[4] The amendment numbers are shown I italics. For more information see section 7.

[5] For certification basis other than listed in columns 6 or 7, such as CAR 4 or Bulletin 7, etc., write in this column. For more information see section 7.

TABLE 1-2. Comparison for Applicability Issues

	Aircraft Alternator/Generator	Installed Alternator/Generator
Weight		
C.G.		
Installation Operational RPM		
Heat Disposition Capacity		
Rotation Direction		
Noise Filter Amperage Rating		
Band Pass Filter Amperage Rating		
Safety Lock Wire or Bend over Tabs on Component		
Belt and Pulley Alignment		
Key or Keyway		
Belt Size/Type		
Noise Filter Rating		

[1] When installing larger capacity alternator the following items may need to be addressed:

- Larger belts are often required.
- Alternator cooling air may not be sufficient.
- Master electrical system breakers may need replacing
- Charging current wires may need replacing
- Battering charging cables may need replacing.

[2] If the new alternator has an internal voltage regulator and the original did not, additional electrical systems investigation will most likely have to be done. Contact an electrical system DER.

b. Checklist Table. This checklist is issued for guidance purposes to help show completeness of documentation for the FAA field approval and return to service process. The checklist is intended to provide guidance information during the approval process and then returning the airplane to service. An airplane alteration is eligible to use this checklist when it has met the requirements outlined in paragraph 8d of this AC.

c. Approval. Alterations meeting the scope described in paragraph c may be approved by using this checklist and completing FAA Form 337. The IA can approve this alteration return to service using DER data entirely approved by completing Block 7, "Approval for Return to Service," of FAA Form 337. The FAA usage of Block 3, "For FAA Use Only," will not be required to accomplish this checklist for alterations that fall within the scope of paragraph c, providing that no data approval is required by AFS/ASI. Should an IA have any questions about the applicability or use of this checklist, they are encouraged to consult with their local FSDO.

d. Checklist Applicability. This alteration must be in compliance with paragraph 8d of this AC, which outlines all the limitations, restrictions and requirements that are applicable to all checklists. This checklist is to be used only on alterations to the following:

- Airplanes of 6,000 pounds or less maximum gross weight
- Airplanes having a single, naturally aspirated reciprocating piston engine
- Unpressurized airplanes
- Belt driven installations of alternator or generator only.

e. Checklist Use. Inspect the alteration and examine its supporting data to verify that they meet the following criteria:

(1) The FAA Form 337 must include engineering analysis to support applicability of installation to aircraft application. Such engineering analysis should include weight, installation, operational Revolutions Per Minute (RPM), heat dissipation compatibility, amperage output compatibility and operational rotation direction compatibility.

(2) If the new alternator or generator replaces an existing alternator or generator, utilize Table 1-2 for applicability issues.

(3) Appropriate operational advisory information should be included in the AFM or FMS.

(4) Many aircraft installations have noise filters installed on the aircraft firewall or firewall area. These filters have amperage ratings that should not be exceeded by the amperage increases of newly installed generators or alternators.

(5) When installing generators or alternators with increased amperage output from original, use the drive belt of the smaller original unit. This will maintain the original failure mode characteristics of the original installation.

(6) Installation must comply with installation instructions and limitations of component manufacture and aircraft standards.

(7) Any additional ICAs are properly documented per 14 CFR, part 23, § 23.1529, requirements.

f. Necessary Approvals.

(1) All initials must be complete in column one, with "Planned FAA Approval Method" selected in column 2-4.

(2) If column 3 is selected on any item, Block 3 of the FAA Form 337 must be signed by an ASI.

(3) An ACO engineer or FSDO inspector may sign in place of any DER signature on any data approval.

g. Applicable Guidance Material.

h. Evidence of DER Authority to Approve.

i. Complete Checklist Process. Send a copy of the completed checklist and reporting data to the local FSDO office, which will, in turn, forward it to the FAA Aircraft Registration Branch, Oklahoma City, Oklahoma, for inclusion in the aircraft record. Submit originals to the aircraft owner or operator to be kept with the aircraft records.

AIRWORTHINESS COMPLIANCE CHECKLIST #2: ALTERNATE FUEL AND OIL LINE FABRICATIONAND INSTALLATION

a. I have determined the planned alteration to be in compliance with paragraph d, checklist applicability.

IA SIGNATURE _____ DATE _____

AIRCRAFT MAKE _____ MODEL _____

SERIAL # _____ N# _____

CERTIFICATION BASIS DATE ON TDCS _____

TABLE 2-1. Alternate Fuel and Oil Lines - Checklist Qualifications for Approved Data Review

Item [1]	Planned FAA Approval Method Pick 1, [2]			Subject Evaluated	(14 CFR)	(CAR 3)	Item to Consider or Intent of the regulation	DER Authority	Other Guidance	
Completed Initials	DER 8110-3	FSDO ASI, 337, Block 3	Other (AC 43.13)		[4]	[5]		[3] (ref. 8110.37	AC Orders Policy	AC 43-13-1B/2A
				Loads	23.301 *N, 28, 42, 48*	3.171	• Limit load is maximum in service. • Analysis to LIM must produce no yield. • Weight for test = bracket structure + associated hoses + oil in hoses.			
				Factor of Safety	23.303 *N*	3.172	• Ultimate = Limit load * 1.50 (50 percent margin of safety).			
				Strength and Deformation	23.305 *N, 45*	3.173	• LIM with no yield. • ULT with no failure.			
				Proof of Structure	23.307 *N*	3.174	• Limit loads are determined by flight (man. and gust) and landing loads. For lack of this data the loads from 23.561 may be used but not required.			
				Materials and Workmanship	23.603 *N*	3.292	• All materials must meet approved specifications. • Hoses in fire area per TSO-C53a, type C/D. • All non-standard aircraft hardware to be substantiated. • Baffle material to withstand engine heat (i.e.silicone impregnated fiberglass). • Grommets, firewall bulkhead fittings, etc.			
				Inspection Provisions	23.611 *N, 7, 48*	3.296	• Inspection and servicing must be accomplished in an appropriate manner.			

TABLE 2-1. Alternate Fuel and Oil Lines - Checklist Qualifications for Approved Data Review (continued)

Item [1] Completed Initials	Planned FAA Approval Method Pick 1, [2] DER 8110-3	FSDO ASI, 337, Block 3	Other (AC 43.13)	Subject Evaluated	(14 CFR) [4]	(CAR 3) [5]	Item to Consider or Intent of the regulation	DER Authority [3] (ref. 8110.37	Other Guidance AC Orders Policy	AC 43-13-1B/2A
				Fuel Flow	23.955 *N, 7, 43, 51*	3.433	• Use hose of equal or greater size.			
				Fuel System Lines and Fittings	23.993 *N, 43*	3.55	• Support line so that no excessive vibration occurs. • Provisions for flexibility for relative motion. • Limitations of flexible hose.			
				Fuel System Components	23.994 *7, 29*	3.172	• Protect hoses from wheels up landing tri gear.			
				Strength and Deformation	23.305 *N, 45*	3.173	• LIM with no yield. • ULT with no failure.			
				Fuel System Drains	23.999 *N, 17, 43*	3.174	• Do not create new "low spots".			
				Oil System Drain	23.1017 *N, 7, 14*	3.57	• Excessive vibration. • Flow rate, install equal or larger size. • Breather lines must: • Not allow condensation to freeze and obstruct line. • Not constitute fire hazard from forming. • Not allow omitted oil from striking windshield. • Not discharge into induction air intake. • Not be prone to blockage by ice.			
				Instructions for Continued Airworthiness	23.1529 *8, 26*		• See separate guidance.			

[1] IA should enter initials to indicate items that have been completed. In some cases items may be left open pending final FSDO/ASI signature in Block 3 of FAA Form 337.

[2] These findings can be made by a FSDO inspector or DER. When FSDO inpector approves an item they must also sign Block 3 of FAA Form 337.

[3] Or other equivalent authority, as evident on this form per DER.

[4] The amendment numbers are shown in italics. For more information see section 7.

[5] For certification basis other than listed in columns 6 or 7, such as CAR 4 or Bulletin 7, etc., write in this column. For more information, see section 7.

b. Checklist Table. This checklist is issued for guidance purposes to help show completeness of documentation for the FAA field approval and return to service process. The checklist is intended to provide guidance information during the approval process and then returning the airplane to service. An airplane alteration is eligible to use this checklist when it has met the requirements outlined in paragraph 8 of this AC.

c. Approval. Alterations meeting the scope described in paragraph d may be approved by using this checklist and completing FAA Form 337. The IA can approve this alteration return to service using DER data entirely approved by completing Block 7, "Approval for Return to Service," of FAA Form 337. The FAA usage of Block 3, "For FAA Use Only," will not be required to accomplish this checklist for alterations that fall within the scope of paragraph c, providing that no data approval is required by AFS/ASI. Should an IA have any questions about the applicability or use of this checklist, they are encouraged to consult with their local FSDO.

d. Checklist Applicability. This alteration must be in compliance with paragraph 8 of this AC, which outlines all the limitations, restrictions and requirements that are applicable to all checklists. This checklist is to be used only on or alterations to the following:

- Airplanes of 12,500 pounds or less maximum gross weight.

e. Checklist Use. Inspect the alteration and examine its supporting data to verify that they meet the following criteria:

(1) Installation must comply with installation instructions and limitations of component manufacture and aircraft standards.

(2) Any additional ICAs are properly documented per 14 CFR, part 23, § 23.1529, requirements.

f. Necessary Approvals.

(1) All initials must be complete in column one with "Planned FAA Approval Method" selected in column 2-4.

(2) If column 3 is selected on any item, Block 3 of the FAA Form 337 must be signed by the ASI.

(3) An ACO engineer or FSDO inspector may sign in place of any DER signature on any data approval.

g. Applicable Guidance Material.

h. Evidence of DER Authority to Approve.

i. Complete Checklist Process. Send a copy of the completed checklist and reporting data to the local FSDO office, which will, in turn, forward it to the FAA Aircraft Registration Branch, Oklahoma City, Oklahoma, for inclusion in the aircraft record. Submit originals to the aircraft owner or operator to be kept with the aircraft records.

AIRWORTHINESS COMPLIANCE CHECKLIST #3: RELOCATION OF AIRPLANE STORAGE BATTERIES

a. I have determined the planned alteration to be in compliance with paragraph d, checklist applicability.

IA SIGNATURE _____ DATE _____

AIRCRAFT MAKE _____ MODEL _____

SERIAL # _____ N# _____

CERTIFICATION BASIS DATE ON TDCS _____

TABLE 3-1. Relocation of Airplane Storage Batteries- Checklist Qualifications for Approved Data Review

Item [1] Completed Initials	Planned FAA Approval Method Pick 1, [2] DER 8110-3	FSDO ASI, 337, Block 3	Other (AC 43.13)	Subject Evaluated	(14 CFR) [4]	(CAR 3) [5]	Item to Consider or Intent of the regulation	DER Authority [3] (ref. 8110.37	Other Guidance AC Orders Policy	AC 43-13-1B/2A
				Loads	23.301 *N, 28, 42, 48*	3.171	• Limit load is maximum in service. • Analysis to LIM must produce no yield.			
				Factor of Safety	23.303 *N*	3.172	• Ultimate = Limit load * 1.50 (50 percent margin of safety).			
				Strength and Deformation	23.305 *N, 45*	3.173	• Load test to limit is okay, structure not deformed permanently. • **DO NOT TEST TO ULTIMATE** conditions for flight test article. If tested to ultimate conditions the article must be thrown out or be tested to verify integrity.			
				Proof of Structure	23.307 *N*	3.174	• Limit loads are determined by flight manual, gust, and landing loads. For lack this data the loads from 23.561 may be used (but not required).			
				Design and Construction, General	23.601 *N*	3.291	• The suitability of each questionable design detail and part having an important bearing on safety in operations, must be established by tests.			
				Inspection Provisions	23.611 *N*	3.296	• Inspection and servicing must be accomplished in an appropriate manner.			
				Instruction for Continued Airworthiness	23.1529 *N*	-	• See separate guidance.			

TABLE 3-1. Relocation of Airplane Storage Batteries- Checklist Qualifications for Approved Data Review (continued)

Item [1] Completed Initials	Planned FAA Approval Method Pick 1, [2] DER 8110-3	FSDO ASI, 337, Block 3	Other (AC 43.13)	Subject Evaluated	(14 CFR) [4]	(CAR 3) [5]	Item to Consider or Intent of the regulation	DER Authority [3] (ref. 8110.37	Other Guidance AC Orders Policy	AC 43-13-1B/2A
				Function and Installation	23.1301 *N, 7, 14, 20*	3.652	• Additional equipment installed (per operating rules) must meet intended function.			
				Electrical System Capacity	23.1351 *N, 7, 14, 17, 20, 34, 43, 49*		• Each electrical system must be adequate for the intended use. • Electric power sources, their transmission cables, and their associated control and protective devices, must be able to furnish the required power at the proper voltage to each load circuit essential for safe operation.			
				Circuit Protective Devices	23.1357 *N, 20, 21, 49*	3.690 3.691 3.692	• A protective device for a circuit essential to flight safety may not be used to protect any other circuit. • If the ability to reset a circuit breaker or replace a fuse is essential to safety in flight, that circuit breaker or fuse must be so located and identified that it can be readily reset or replaced in flight. For fuses identified as replaceable in flight: (1) There must be one spare of each rating or 50 percent spare fuses of each rating, whichever is greater; and (2) The spare fuse(s) must be readily accessible to any required pilot.			

TABLE 3-1. Relocation of Airplane Storage Batteries- Checklist Qualifications for Approved Data Review (continued)

Item [1] Completed Initials	Planned FAA Approval Method Pick 1, [2]			Subject Evaluated	14 CFR [4]	(CAR 3) [5]	Item to Consider or Intent of the regulation	DER Authority [3] (ref. 8110.37	Other Guidance	
	DER 8110-3	FSDO ASI, 337, Block 3	Other (AC 43.13)						AC Orders Policy	AC 43-13-1B/2A
				Electric Cables and Equipment	23.1365 *N, 14, 43, 49*	3.693	• Each electric connecting cable must be of adequate capacity. • Any equipment that is associated with any electrical cable installation and that would overheat in the event of circuit overload or fault must be flame resistant. That equipment and the electrical cables must not emit dangerous quantities of toxic fumes. • Cables should meet MIL-DTL-27500 or equivalent specification.			

[1] IA should enter initials to indicate items that have been completed. In some cases items may be left open pending final FSDO/ASI signature in Block 3 of FAA Form 337.

[2] These findings can be made by a FSDO inspector or DER. When FSDO inpector approves an item they must also sign Block 3 of FAA Form 337.

[3] Or other equivalent authority, as evident on this form per DER.

[4] The amendment numbers are shown in italics. For more information see section 7.

[5] For certification basis other than listed in columns 6 or 7, such as CAR 4 or Bulletin 7, etc., write in this column. For more information see section 7.

b. Checklist Table. This checklist is issued for guidance purposes to help show completeness of documentation for the FAA field approval and return to service process. The checklist is intended to provide guidance information during the approval process and then returning the airplane to service. An airplane alteration is eligible to use this checklist when it has met the requirements outlined in paragraph 8 of this AC.

c. Approval. Alterations meeting the scope described in paragraph d may be approved by using this checklist and completing FAA Form 337. The IA can approve this alteration return to service using DER data entirely approved by completing Block 7, "Approval for Return to Service," of FAA Form 337. The FAA usage of Block 3, "For FAA Use Only," will not be required to accomplish this checklist for alterations that fall within the scope of paragraph c, providing that no data approval is required by AFS/ASI. Should an IA have any questions about the applicability or use of this checklist, they are encouraged to consult with their local FSDO.

d. Checklist Applicability. This alteration must be in compliance with paragraph 8 of this AC, which outlines all the limitations, restrictions and requirements that are applicable to all checklists. This checklist is to be used only on repairs or alterations to the following:

- Airplanes of 6,000 pounds or less maximum gross weight
- Airplanes having a single, naturally aspirated reciprocating piston engine
- Unpressurized airplanes.

e. Checklist Use. Inspect the alteration and examine its supporting data to verify that they meet the following criteria:

(1) Appropriate operational advisory information should be included in the AFM or FMS.

(2) Installation must comply with installation instructions and limitations of component manufacture and aircraft standards.

(3) Any additional ICAs are properly documented per 14 CFR, part 23, § 23.1529, requirements.

f. Necessary Approvals.

(1) All initials must be complete in column one, with "Planned FAA Approval Method" selected in column 2-4.

(2) If column 3 is selected on any item, Block 3 of the FAA Form 337 must be signed by the ASI.

(3) An ACO engineer or FSDO inspector may sign in place of any DER signature on any data approval.

g. Applicable Guidance Material.

h. Evidence of DER Authority to Approve.

i. Complete Checklist Process. Send a copy of the completed checklist and reporting data to the local FSDO office, which will, in turn, forward it to the FAA Aircraft Registration Branch, Oklahoma City, Oklahoma, for inclusion in the aircraft record. Submit originals to the aircraft owner or operator to be kept with the aircraft records.

AIRWORTHINESS COMPLIANCE CHECKLIST #4: INSTALLATION OF TAIL WHEEL SPRINGS

a. I have determined the planned alteration to be in compliance with paragraph d, checklist applicability.

IA SIGNATURE _____ DATE _____

AIRCRAFT MAKE _____ MODEL _____

SERIAL # _____ N# _____

CERTIFICATION BASIS DATE ON TDCS _____

TABLE 4-1. Installation of Tail Wheel Springs. - Checklist Qualifications for Approved Data Review

Item [1] Completed Initials	Planned FAA Approval Method Pick 1, [2]			Subject Evaluated	(14 CFR) [4]	(CAR 3) [5]	Item to Consider or Intent of the regulation	DER Authority [3] (ref. 8110.37	Other Guidance	
	DER 8110-3	FSDO ASI, 337, Block 3	Other (AC 43.13)						AC Orders Policy	AC 43-13-1B/2A
				Loads	23.301	3.171	• Limit load is maximum in service. • Analysis to LIM must produce no yield. • Weight for test = bracket structure + associated hoses + oil in hoses.			
				Factor of Safety	23.303	3.172	• Ultimate = Limit load * 1.50 (50 percent margin of safety).			
				Strength and Deformation	23.305	3.173	• LIM with no yield. • ULT with no failure.			
				Proof of Structure	23.307	3.174	• Limit loads are determined by flight manual, gust, and landing loads. For lack of this data the loads from 23.561 may be used (but not required).			
				Materials and Workmanship	23.603	3.292	• All materials must meet approved specifications. • Hoses in fire area per TSO-C53a, type C/D. • All non-standard aircraft hardware to be substantiated. • Baffle material to withstand engine heat (i.e.silicone impregnated fiberglass). • Grommets, firewall bulkhead fittings, etc.			
				Inspection Provisions	23.611	3.296	• Inspection and servicing must be accomplished in an appropriate manner.			

TABLE 4-1. Installation of Tail Wheel Springs. - Checklist Qualifications for Approved Data Review (continued)

Item [1] Completed Initials	Planned FAA Approval Method Pick 1, [2] DER 8110-3	FSDO ASI, 337, Block 3	Other (AC 43.13)	Subject Evaluated	(14 CFR) [4]	(CAR 3) [5]	Item to Consider or Intent of the regulation	DER Authority [3] (ref. 8110.37	Other Guidance AC Orders Policy	AC 43-13-1B/2A
				Supplementary Conditions for Tail Wheels	23.497		• Supplementary conditions for tail wheels.			
				Side Load Conditions	23.485		• Suitable design loads must be established for the tail wheel, bumper, or energy absorption device.			
				Ground Load; Unsymmetrical Loads on Multiple-Wheel Units	23.511		• Ground load; unsymmetrical loads on multiple-wheel units.			
				General	23.471		• Ground loads general.			
				Tail Down Landing Conditions	23.481		• One-wheel landing conditions.			

[1] IA should enter initials to indicate items that have been completed. In some cases items may be left open pending final FSDO/ASI signature in Block 3 of FAA Form 337.

[2] These findings can be made by a FSDO inspector or DER. When FSDO inpector approves an item they must also sign Block 3 of FAA Form 337.

[3] Or other equivalent authority, as evident on this form per DER.

[4] The amendment numbers are shown in italics. For more information see section 7.

[5] For certification basis other than listed in columns 6 or 7, such as CAR 4 or Bulletin 7, etc., write in this column. For more information see section 7.

b. Checklist Table. This checklist is issued for guidance purposes to help show completeness of documentation for the FAA field approval and return to service process. The checklist is intended to provide guidance information during the approval process and then returning the airplane to service. An airplane alteration is eligible to use this checklist when it has met the requirements outlined in paragraph 8 of this AC.

c. Approval. Alterations meeting the scope described in paragraph d may be approved by using this checklist and completing FAA Form 337. The IA can approve this alteration return to service using DER data entirely approved by completing Block 7, "Approval for Return to Service," of FAA Form 337. The FAA usage of Block 3, "For FAA Use Only," will not be required to accomplish this checklist for alterations that fall within the scope of paragraph c, providing that no data approval is required by AFS/ASI. Should an IA have any questions about the applicability or use of this checklist, they are encouraged to consult with their local FSDO.

d. Checklist Applicability. This alteration must be in compliance with paragraph 8 of this AC, which outlines all the limitations, restrictions and requirements that are applicable to all checklists. This checklist is to be used only on alterations to the following:

- Airplanes of 12,500 pounds or less maximum gross weight.

e. Checklist Use. Inspect the alteration and examine its supporting data to verify that they meet the following criteria:

(1) Appropriate operational advisory information should be included in the AFM or FMS.

(2) Installation must comply with installation instructions and limitations of component manufacture and aircraft standards.

(3) Any additional ICAs are properly documented per 14 CFR, part 23, § 23.1529, requirements.

f. Necessary Approvals.

(1) All initials must be complete in column one, with "Planned FAA Approval Method" selected in column 2-4.

(2) If column 3 is selected on any item, Block 3 of the FAA Form 337 must be signed by the ASI.

(3) An ACO engineer or FSDO inspector may sign in place of any DER signature on any data approval.

g. Applicable Guidance Material.

h. Evidence of DER Authority to Approve.

i. **Complete Checklist Process.** Send a copy of the completed checklist and reporting data to the local FSDO office, which will, in turn, forward it to the FAA Aircraft Registration Branch, Oklahoma City, Oklahoma, for inclusion in the aircraft record. Submit originals to the aircraft owner or operator to be kept with the aircraft records.