

Standard Design Changes: Acceptable Technical Data

General

Civil Aviation Authority advisory circulars contain guidance and information about standards, practices, and procedures that the Director has found to be an **acceptable means of compliance** with the associated rules and legislation.

However the information in the advisory circular does not replace the requirement for participants to comply with their own obligations under the Civil Aviation rules, the Civil Aviation Act 1990 and other legislation.

An advisory circular reflects the Director's view on the rules and legislation. It expresses CAA policy on the relevant matter. It is not intended to be definitive. Consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices, or procedures are found to be acceptable they will be added to the appropriate advisory circular. Should there be any inconsistency between this information and the rules or legislation, the rules and legislation take precedence.

An advisory circular may also include **guidance material** generally, including guidance on best practice as well as guidance to facilitate compliance with the rule requirements. However, guidance material should not be regarded as an acceptable means of compliance.

An advisory circular may also include **technical information** that is relevant to the standards or requirements.

Purpose

This advisory circular provides methods, techniques, and practices that are acceptable to the Director for showing compliance with Civil Aviation Rule Part 43 *General Maintenance Rules*, technical instructions which are acceptable technical data under Part 21, Appendix D(a)(6).

Related Rules

This advisory circular relates specifically to Civil Aviation Rule Part 43 *General Maintenance Rules*.

Change Notice

This revision amends the title of the advisory circular and incorporates the following appendices.

- Appendix 2 : Installation of FAA TSO-C126 () ELTs
- Appendix 13: Installation of Stand-alone ADS-B Systems
- Appendix 14: Temporary Mounting of Lightweight Cameras

Cancellation Notice

This advisory circular cancels AC43-14 Revision 4 dated 10 June 2016.

Version History

History Log

Revision No.	Effective Date	Summary of Changes
0	16 November 1998	This was the initial issue of this advisory circular.
1	07 October 2002	Revision 1 provided examples of avionic major modifications in the definition of “Major Modification”.
2	27 April 2007	Revision 2 altered a number of references.
3	12 March 2008	Revision 3 revised Appendix 2 to reflect the requirements for the installation of 406 MHz ELTs. The references to FAA AC 43.13-1A were revised to FAA 43.13-1B, and SAE-AS23190 supersedes MIL-S-23190E. The case of multi-sensor integrated systems that have all switching internal to the unit being considered directly coupled was clarified. This revision also added Appendix 12 for the installation of FLARM Situational Awareness equipment into gliders.
4	10 June 2016	Revision 4 provided clarity around the use of this advisory circular and information requirements to be forwarded to CAA.
5	05 July 2019	This revision: <ul style="list-style-type: none">• amends the title of the advisory circular.• incorporates the following appendices:<ul style="list-style-type: none">○ Appendix 2: Installation of FAA TSO-C126 () ELTs○ Appendix 13: Installation of Stand-alone ADS-B Systems○ Appendix 14: Temporary Mounting of Lightweight Cameras.

		<p>Changes to the advisory circular are as follows:</p> <ul style="list-style-type: none">• change notice is updated• cancellation notice is inserted• history log is inserted• the numbering system is revised• the content of AC43-14 Revision 4 is revoked and replaced.
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1. Introduction

1.1 All design changes to aircraft must be carried out in accordance with acceptable technical data. Acceptable technical data is listed in Part 21, Appendix D.

1.2 Part 21, Appendix D(a)(6) specifically identifies data published in an advisory circular (AC) as acceptable technical data.

1.3 Please note that Appendix D(a) lists other acceptable technical data (than specified in this advisory circular), including the possibility to have data approved by the Director under rule 21.505.

1.4 This advisory circular provides acceptable technical data for standard design changes. Installers may find this advisory circular useful for implementing some common, low-risk modifications to general aviation aircraft without having to approach the Director or a certificated Part 146 aircraft design organisation for further approval.

NOTE: *When this advisory circular is used for any purpose, all elements of the advisory circular are to be considered and complied with in their entirety.*

2. Applicability

2.1 This advisory circular is applicable to unpressurised aircraft of less than 5700kg MCTOW and with a maximum certified seating capacity of less than 10 passenger seats, but only when:

- (a) The installation of the modification is not classified as a major modification by the LAME or appropriately authorised person in accordance with Part 43 (see AC43-9 Appendix A).
- (b) The data is not in conflict with the type certificate holder's data.

2.2 If a modification is not listed in one of the appendices, this advisory circular does not apply.

NOTE: *AC43-14 does not apply to light sport aircraft (LSA) which have been issued an airworthiness certificate under rule 21.201, as the certificate requires the LSA manufacturer to approve all changes to the type design.*

3. General

3.1 This advisory circular is divided into two parts:

- (a) The first part provides the general elements that must be addressed for all modifications conducted under this advisory circular, noting that not all elements will be required in all cases. When an element is not required in a particular case, this advisory circular expressly provides so.
- (b) The second part consists of a series of appendices which provide the specific elements that should be addressed in the particular types of modifications covered by this advisory circular.

3.2 Part 21, Appendix D, lists the types of technical data that are considered to be acceptable for modifications and repairs to products and their associated systems and components.

3.3 Part 21, Appendix D (a)(6) states that data provided by the CAA in an advisory circular is acceptable technical data.

3.4 A major modification or repair is one that could potentially affect the safety of an aircraft or its occupants where, as a result of its embodiment, one or more of a series of incidents may occur. This advisory circular does not apply to major modifications.

3.5 This advisory circular is intended as an enabler for installers of those modifications that are deemed low-risk, where the requirement to involve a certificated Part 146 design organisation does not substantially add value to the certification process.

3.6 In general, this advisory circular only includes minor design changes covering non-complex, non-integrated systems installed on a non-interference basis.

3.7 It is important to note that if a particular modification cannot comply fully with requirements in this advisory circular, then the modification is not covered and another means of acceptance or approval of the technical data must be sought.

3.8 Provided the modification is not classified as major and the data is not in conflict with the type certificate holder's data, this advisory circular provides acceptable technical data, within specified limitations and conditions, for modifications covering the following equipment:

- (a) Replacement fit-form-function avionics systems.
- (b) FAA TSO-C126 ()¹ ELTs.
- (c) Transponder/encoder (noting that this excludes Mode S and ADS-B).
- (d) VFR GPS (noting that this excludes GPS units optimised for specialist applications such as agricultural aviation).
- (e) Audio and intercom.
- (f) VHF communication plus VHF radio navigation and DME.
- (g) Voltage converters.
- (h) Non-aeronautical electronics equipment.
- (i) 12VDC electrical distribution system for gliders.
- (j) Situation awareness equipment for gliders.
- (k) Removal of avionics equipment.
- (l) Installation of stand-alone ADS-B systems.
- (m) Temporary mounting of lightweight cameras.

¹ When a () is inserted after a TSO reference, it means that all versions of that TSO are allowed.

4. Definitions

See also Civil Aviation Rules Part 1 for other terms.

Fit-form-function in respect of avionics equipment, is equipment that:

- (a) is specified by a manufacturer to be a direct replacement for another item of equipment
- (b) utilises the same:
 - (1) mounting provisions,
 - (2) wiring,
 - (3) connectors; and
- (c) has an equivalent level of performance and certification.

NOTE: *Communication and navigation equipment must be the same level as defined in Part 91, Appendix A.9.*

NOTE: *Special attention must be paid to the software configuration and version to determine functionality equivalence.*

Major modification is defined in Civil Aviation Rule Part 1. When determining whether or not a modification to an aircraft, system, component, part, wiring, appliance or software is “major”, the criteria below should be considered:

- (a) What is the appreciable effect on weight?
- (b) What is the appreciable effect on balance?
- (c) What is the appreciable effect on structural strength?
- (d) What is the appreciable degradation of reliability or performance?
- (e) Interfaces and degree of integration with other systems?
- (f) What is the appreciable effect on operational characteristics of the product?
- (g) What is the change to the flight manual other than the addition of a supplement?
- (h) Whether it introduces or affects a function where the operating condition or a failure condition is catastrophic or hazardous? (i.e. incapacitating injury to any occupant, structural collapse, loss of control, failure of motive power, or unintentional operation of, or inability to operate, any systems or equipment essential to the safety or operational function of the aircraft).
- (i) Whether it is mandated by an airworthiness directive or terminating action of an airworthiness directive?
- (j) Whether the change is accomplished by methods other than acceptable methods, techniques and practices or elementary operations?
- (k) Whether the change will be a significant change to primary structure or life limited parts?
- (l) Whether the change will affect the product’s TSO?

Examples of a major modification include the installation of, or changes to:

- (a) penetration of pressure vessels such as antenna and doubler installations to pressurised areas
- (b) primary structural elements such as spars
- (c) HF radio transmitter systems
- (d) GPS/GNSS systems required for IFR operations
- (e) cockpit panels on rotorcraft approved for NVIS.
- (f) any avionics modification that has the potential to interfere with critical systems, such as modifications to aircraft fitted with:
 - (1) FADEC (full authority digital engine control); or
 - (2) fly by wire systems.

Non-aeronautical electronics equipment for the purpose of this advisory circular means electrical and electronic equipment that is:

- (a) not required by an airworthiness or rule requirement
- (b) suitable for installation and use in aircraft
- (c) installed on a no-hazard, no-interference basis.

Examples of non-aeronautical equipment are cellular telephones or CD players.

Stand-alone installation in respect of an avionics installation means one where the equipment being installed is not interfaced with any other avionics systems or component, other than connection to an existing approved electrical power distribution system.

- (a) A stand-alone installation includes all components associated with the function being installed.
- (b) Example:
 - (1) For a VHF installation it could include the transceiver, controller, antenna, rack and wiring.
 - (2) A major modification or a modification involving a change to a component or appliance is not to be considered a stand-alone installation.
 - (3) For an ADS-B system installation it could include the transponder, antenna, rack, remote control head, wiring and dedicated GNSS position source unit.

Transverse separation means the separation of the aircraft fuselage across the longitudinal axis.

5. Acceptable Technical Data

5.1 This advisory circular provides acceptable technical data at the appendices for various installations that are generally not considered major modifications.

5.2 The appendices should be used in conjunction with the equipment manufacturers' data including:

- (a) installation manuals
- (b) installation and checkout manuals
- (c) operation and installation instructions
- (d) installation drawings.

6. Equipment Selection

6.1 Regardless of the equipment selected, all items must be appropriate for the aircraft and function, be fit for purpose and safe.

7. Equipment Installation

7.1 The equipment should be installed so that it will be adequately restrained throughout the flight envelope.

7.2 Care should also be taken to ensure that the installation will not interfere with any controls. If necessary, restraints should be installed at the rear of avionics racks to provide additional support.

7.3 The installation of equipment under the provisions of this advisory circular must consider the overall human factors involved in the installation, including but not limited to:

- (a) Indicators and controls are clearly visible to the crew.
- (b) The new equipment or modified installation will not impair crew visibility.
- (c) The crew can operate controls required in flight from their normally seated position.
- (d) Misleading information must not be presented to the crew; the source of all data presented to the crew must be easily determined.
- (e) Readability of displays and indicators under varying light conditions must be considered.
- (f) Controls and switches must be clearly labelled and operate in accordance with the instinctive directions.

8. Equipment Cooling

8.1 The manufacturer's installation manual should be consulted with regards to any special cooling requirements for the equipment being installed. In particular the heating effect of installing a number of items of equipment in close proximity, e.g. a radio stack, should be considered.

9. Antenna Location

- 9.1 If an antenna is being installed, the antennae should be located at:
- (a) the aircraft manufacturer-approved location; or
 - (b) a location determined in accordance with FAA AC43.13-2B Chapter 3; or
 - (c) where a location is not specified or cannot be determined under paragraphs (a) or (b), the following guidelines should be followed:
 - (1) the antennae should not be located within 0.9m of each other
 - (2) due to the sensitivity of the receiver, GPS antennas should not be located within 1.1m of a transmitter antenna.
- 9.2 Where an antenna is not installed in an approved location, suitable testing should be carried out to determine the suitability of the selected location. These provisions should include tests to ensure the satisfactory operation of the system being installed and a check for no-interference between other avionics systems. A certificated Part 146 design organisation may be able to substantiate an antenna location if paragraph 9.1 cannot be complied with (e.g. due to proximity with existing antenna).
- 9.3 Refer to Appendix 2 of this advisory circular for the installation of FAA TSO-C126 () ELT antennas, and AC43-11 for guidance on the installation of AELS antennas.

10. Wiring and Wiring Practices

- 10.1 All electrical wiring and wiring practices should be conducted in accordance with SAE AS 50881F, FAA AC43.13-1B chapter 11.

11. Weight and Balance

- 11.1 The change in weight and balance, which results from the change, is to be amended in accordance with advisory circular AC43-2.
- 11.2 When discrete equipment is installed or removed, the weight and balance records should be revised to reflect the change.
- 11.3 Only installation materials such as interconnecting wire that is distributed through the aircraft may be considered 'negligible' provided the weight change due to those materials is less than 0.1% of the aircraft maximum weight.

12. Electrical Load Analysis

- 12.1 An electrical load analysis (ELA) is to be carried out (refer advisory circular AC21-11 & 91-23) by the installer to determine that the:
- (a) electrical load is less than rated % of the maximum continuous operating rating of the power generating system

- (b) derated battery capacity is sufficient to operate emergency systems for the required time determined for the aircraft, following a failure the aircraft's power generating system or as required for the aircraft's operations.

13. Post-installation Testing

13.1 The installation is to be tested in accordance with the checkout procedures in the manufacturers' manuals and the applicable requirements of Part 43.

13.2 The tests should include, but are not limited to the following.

- (a) The system operates correctly in accordance with the manufacturers' specifications.
- (b) There is no interference between systems (see below).
- (c) The equipment is suitable for the intended purpose.
- (d) The installation meets the relevant structural requirements (as defined by the airworthiness design standards of the aircraft's original certification basis as it appears in the type certificate data sheet (TCDS)) and will be restrained throughout the flight envelope. The installation should not significantly affect crashworthiness, canopy jettison and emergency exit. Special consideration is necessary for equipment installed at locations above or behind occupants.
- (e) The system does not pose any HMI issues to the crew. The installation must take into account arrangement, visibility and interferences with other displays or equipment.
- (f) There is no effect on the aircraft's magnetic compass system.
- (g) The installation does not interfere with any controls (including flight controls, engine controls, equipment, instruments and switches). These checks should include but are not limited to:
 - (1) a check of all flying controls for full and free movement; and
 - (2) a check of engine control levers to ensure that there is no restriction throughout their range of movement.

13.3 Check for non-interference

13.3.1 Part of the post-installation checks should include a test to determine that there is no interference between avionics/electrical systems.

13.3.2 Consider these factors when determining the extent of the no-interference check:

- (a) Type of system(s) being installed.
- (b) Degree of complexity of the systems interconnected.
- (c) Physical location of equipment.
- (d) Cable routing.
- (e) Antenna locations.
- (f) Consequence of any interference on the ability to safely operate the aircraft and systems.

13.3.3 For systems being installed in accordance with this advisory circular, a simplified no-interference check should be acceptable. A simplified check to determine no-interference between avionics systems should incorporate the following guidelines with the test procedures and the results to be documented:

- (a) All avionics systems should be turned ON and the AELS should be ARMED.
- (b) Each of the following items of equipment should be operated in sequence and all other systems checked for any interference:
 - (1) RF transmitters (any equipment that emits RF, such as communication radios, bluetooth, cellular and wifi-transmitting equipment).
 - (2) Equipment with a high voltage switched power source such as a strobe.
 - (3) Equipment containing motors or generators.
- (c) In addition, GPS equipment should be specifically checked for interference when transmitting on each VHF for 20 seconds on each of the following frequencies:
 - (1) 121.150 MHz
 - (2) 121.175 MHz
 - (3) 121.200 MHz
 - (4) 131.250 MHz
 - (5) 131.275 MHz
 - (6) 131.300 MHz
- (d) When looking for interference, the following should be considered:
 - (1) Is there any audible interference in the aircraft audio, intercom or communication systems?
 - (2) Is there any observable change in navigation information including:
 - (i) heading pointers
 - (ii) to/from indications
 - (iii) deviation signals
 - (iv) validity flags
 - (v) warning/message annunciations
 - (vi) loss of navigation information
 - (3) is there any inadvertent operation or failure-to-operate of any system?
- (e) A validation flight may be required to check some systems for interference effects e.g. an existing autopilot.

NOTE: Flight validation checks should only be carried out after ground tests have been completed satisfactorily and in accordance with the rules.

13.3.4 If there is any doubt about the acceptability of an aircraft system to successfully complete checks for no-interference, the details of the installation and problem should be referred to CAA's Airworthiness Unit.

14. Modification Documentation

14.1 The modification is to be documented by completing form CAA043-01 *Modification Record* and adding this to the aircraft maintenance records.

14.2 The aircraft modification section of the maintenance records must be updated to reflect the incorporation of the modification.

14.3 A copy of the form CAA043-01 *Modification Record* along with the attachments required must be sent to the CAA within 28 days of the certification of release to service being issued. Forward to airworthiness@caa.govt.nz or Airworthiness Unit, Civil Aviation Authority, P.O. Box 3555, Wellington 6140.

14.4 Airworthiness directives may impact on the major modification determination and must be reviewed to determine whether any are applicable to the system being installed or the areas of the aircraft to be modified are subject to any airworthiness directives. Any outstanding airworthiness directives are to be actioned.

14.5 Certification

14.5.1 The certification of release to service in respect of modifications embodied using this advisory circular as acceptable technical data, must be issued by an appropriately qualified person in accordance with Part 43.

14.5.2 It is important to note that this advisory circular only provides for the acceptance of the technical data (in relation to Part 21), and that **it does not extend the certification privileges granted** by any specific aircraft maintenance engineer licence category, Part 145 authorisation, or certificate of maintenance approval.

14.5.3 In the case of a certificated Part 145 maintenance organisation authorisation, the company exposition will detail the privileges of each authorisation.

14.5.4 Prior to exercising privileges of an AME licence in any category all licence holders must ensure that an appropriate rating is held and that they are familiar with the task to be undertaken.

14.5.5 For example a radio rated engineer must be familiar with the airframe structural implications of installing an antenna prior to fitment in a specific location.

14.6 Form CAA 2129 action

14.6.1 If you are required to amend form CAA 2129, where a change is made in accordance with this advisory circular, the Mod Ref column of the form CAA 2129 adjacent to the entry for the equipment being installed or removed should provide a reference to advisory circular AC43-14 and the appropriate appendix.

14.7 Integrated systems

14.7.1 Equipment that combines two or more functions into a single unit is now available. These systems may not be installed using the provisions of this advisory circular unless specifically identified as acceptable and expressly listed in the appendices.

14.7.2 Units that interface with multiple systems may not be installed using the provisions of this advisory circular unless specifically identified as acceptable and expressly listed in the appendices.

14.7.3 This advisory circular does not apply to complex or multi-function systems which may require system safety assessments, including analysis of common modes of failure, cascading failures and single point failures to be addressed as part of a design approval process.

14.8 Instructions for continued airworthiness

14.8.1 For all equipment installed, conduct a review and/or an assessment of the requirements for ongoing maintenance to ensure continued airworthiness.

14.8.2 Generate and issue instructions for continued airworthiness, to include maintenance actions, inspections and intervals as required.

14.8.3 These requirements are to be generated as instructions for continued airworthiness (ICA) and added to the aircraft's maintenance schedule.

14.9 Flight manual supplements / Pilot guides

14.9.1 For all equipment installed, conduct a review and/or an assessment of the aircraft flight manual (AFM) operational limitations, procedures and performance sections to ensure no changes are required.

14.9.2 Changes to certified aircraft operating limitations, performance and procedures are considered major design changes (e.g. change from VFR to IFR, removal or addition of limitations, change to flight envelope, etc.) and are beyond the scope of this advisory circular.

14.9.3 Information contained in a pilot guide, user manuals or operating instructions supplied by the equipment manufacturer for the installed equipment may be inserted as a supplement to the AFM or pilot operating handbook (POH) to ensure continued safe operations.

A1. APPENDIX 1—Replacement ‘Fit-Form-Function’ Equipment

A1.1 Description

A1.1.1 Replacement of existing avionics equipment with equipment of identical fit, form and function.

A1.2 Applicability

A1.2.1 All limitations of paragraph 2.1 apply.

A1.2.2 Paragraphs 1 to 14 of this advisory circular apply.

A1.3 General

A1.3.1 Replacement fit-form-function equipment must:

- (a) perform an identical function to the equipment being replaced
- (b) not alter the existing approved aircraft maintenance requirements
- (c) be of an equivalent approval level as defined in Part 91, Appendix A.9
- (d) be specified by the equipment manufacturer as being a direct replacement for the equipment being removed.

A1.3.2 Replacement fit-form-function installations must utilise where applicable the existing:

- (a) equipment rack or mounting provisions
- (b) wiring
- (c) interface with existing systems.

A1.4 Technical instructions

A1.4.1 Ensure the aircraft is safe for servicing.

A1.4.2 Open circuit breakers or remove fuses as required to isolate power from the system(s) to be replaced.

A1.4.3 Remove access panels, etc. as required in accordance with the aircraft manufacturer’s maintenance manual.

A1.4.4 Verify that the circuit breaker or fuse rating from the equipment to be removed is appropriate for the new equipment. If the fuse or circuit breaker rating is not appropriate for the new equipment, the modification is no longer the replacement of form, fit and function equipment and capable of approval under the provisions of Appendix 1 to this advisory circular.

A1.4.5 Remove the equipment(s) to be replaced. Existing associated wiring and rack(s) or mounting provisions are to be retained.

A1.4.6 Install the replacement equipment(s) in accordance with the manufacturer’s installation instructions and the aircraft maintenance manual in the space vacated in paragraph A1.4.5. The existing rack(s) or mounting provisions are to be utilised.

A1.4.7 Replace the access panels removed in paragraph A1.4.3 in accordance with the aircraft manufacturer’s maintenance manual.

A1.4.8 Close the circuit breakers or reinstall the fuses removed in paragraph A1.4.2.

A1.4.9 Carry out a functional test of the installed system and all other disturbed systems in accordance with the applicable Part 43 and the manufacturer's installation/operation instructions. A check is to be carried out to ensure that there is no interference between avionics systems, that there is no effect on the aircraft compass system and that there is no interference with the aircraft flight controls.

A1.4.10 Amend the aircraft's weight and balance records (refer AC43-2).

A1.4.11 Complete or update ELA, retain copy with aircraft and submit copy with documentation (refer AC21-11 & 91-23).

A1.4.12 Amend the aircraft's form CAA 2129 if necessary (refer AC43-10).

A1.4.13 Generate and issue instructions for continued airworthiness (refer paragraph 14.8).

A1.4.14 Insert the equipment operating instructions in the AFM/POH (refer paragraph 14.9).

A1.4.15 Complete form CAA043-01 *Modification Record* and process as described in paragraph 14 of this advisory circular.

A1.4.16 Make a certified statement of release to service in accordance with rule 43.105, detailing the work carried out and conformity with Appendix 1 of this advisory circular.

A2. APPENDIX 2—Installation of FAA TSO-C126 () ELTs

A2.1 Description

A2.1.1 Installation of FAA TSO-C126 ()1 ELTs including the associated remote switch/ monitor and antenna.

A2.2 Applicability

A2.2.1 All limitations of paragraph 2.1 apply.

A2.2.2 Paragraphs 1 to 14 of this advisory circular apply.

A2.3 General

A2.3.1 Part 91, Appendix A.15 (a), requires that all ELTs installed after 22 November 2007 must meet the requirements of TSO-C126 ()1.

A2.3.2 This equipment should be installed in accordance with the requirements of the following.

- (a) The manufacturers' installation instructions.
- (b) Any airworthiness directives applicable to the aircraft type (e.g. DCA/HELI/3)
- (c) Advisory circular AC43-11.

A2.4 Technical instructions

A2.4.1 Register the new ELT with RCCNZ and advise them of the hex code for the beacon prior to return to service. Proof of the registration is required for completion of the modification.

A2.4.2 Ensure the aircraft is safe for servicing.

A2.4.3 Remove access panels etc. as required in accordance with the aircraft manufacturer's maintenance manual.

A2.4.4 If an existing ELT is to be removed:

- (a) Open the ELT circuit breaker or remove the ELT fuse, as required, to isolate power from the existing ELT.
- (b) Remove the existing ELT and antenna (if not compatible with the new ELT), remote switch/monitor (if installed), ELT mounting tray and wiring.
- (c) Verify that any wiring that is to be re-used for the new ELT installation is of a type acceptable per FAA AC43.13-1B, Chapter 11, is in good condition, and is correctly installed.

A2.4.5 Install the ELT as follows:

- (a) Determine a suitable location for the ELT. The ELT should be located.
 - (1) Where the ELT can be mounted to primary structure.
 - (2) Where the probability of damage in an accident or impact is minimised.
 - (3) For fixed and deployable automatic ELTs, as far as practicable.
 - (4) The distance between the ELT and the antenna is the least practicable.
 - (5) To prevent inadvertent operation of the crash activation sensor.

- (6) With the axis orientated to sense a primary crash pulse in accordance with the ELT manufacturer's instructions. In particular, check that any AF model, e.g. Artex ME406 or Kannad Compact fitted in any helicopter is oriented / installed at 45 degrees. An AF-H must be a horizontal or vertical installation.
 - (7) Where the risk of a transverse separation severing the antenna cable is minimised. Transverse separations are likely to occur at production joints in the structure; the antenna cable must not cross these locations.
- (b) Install the ELT mounting tray at the location determined in paragraph A2.4.5(a)
- (1) The installation is to be carried out in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.
 - (2) The installation should conform to the following requirements.
 - (i) The ELT must be mounted to primary load-carrying structure such as trusses, bulkheads, longerons or floor beams (not aircraft skin) in such a manner that it does not degrade the aircraft structural capability. For aircraft using composite technology, standard composite structural techniques may be used to attach the equipment to the moulded structure.
 - (ii) Manufacturer-supplied or standard parts should be used.
 - (iii) When a force of 450 newtons (100 lbf) is applied to the mount in the most flexible direction there is no static deflection greater than 2.5mm (0.1 inch) relative to a section of adjacent structure located between 0.3m (1 foot) and 1.0m (3 feet) from the mount site.
 - (iv) Where a stiffening modification is required to the aircraft structure to show compliance with paragraph A2.4.5(b)(2)(iii), the modification is to be carried out in accordance with the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.
 - (v) The installed transmitter should be able to support a 100 G load in the plus and minus directions of the three principle axes of the aircraft. For example: for an ELT weighing 0.9kg (2 lb), this is a load of 900 newtons (200 lb) in any direction.
 - (vi) Install a placard externally adjacent to the ELT installation which readily and clearly identifies the ELT location.

A2.4.6 Install the ELT remote switch/monitor assembly as follows:

- (a) Determine a suitable location for the remote switch/monitor assembly which must be located in a position which is accessible and viewable by the pilot from his/her normally seated position.
- (b) Install the ELT remote switch/monitor assembly in the location determined in paragraph A2.4.5(a), in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.

A2.4.7 Install the ELT antenna as follows:

- (a) Determine a suitable location for the ELT antenna using the following criteria.
 - (1) The ELT antenna should be located on the upper fuselage and not less than the manufacturer's recommended distance from other antennas.

- (i) In any case, the ELT antenna is not to be located less than 0.6m (24 inches) from other VHF antennas.
- (2) The ELT antenna should be located as close as possible to the ELT transmitter and preferably where the aircraft structure can provide some protection (particularly the antenna base) during a crash sequence. When installing an antenna near a structural element, take care to avoid the structure shrouding the antenna or causing excessive voltage standing wave ratio (VSWR) degradation.
 - (i) Always check the VSWR after installation. The VSWR should be less than 2:1 and must not exceed 3:1.
- (3) The ELT antenna should be located so as to be vertically polarised.
 - (i) The antenna location must ensure that the routing of the ELT transmitter-to-antenna coaxial cable does not cross any fuselage production joints and should avoid any other location where a transverse separation is likely.
 - (ii) If possible, do not install the antenna cable so that it passes through any bulkhead or similar structure.
- (4) If the ELT antenna is mounted internally in the aircraft, the antenna is to be insulated from metal parts and exposed to an 'electronic' window of at least 0.3 m (1 foot) square.
- (b) Install the ELT antenna in the location determined above, in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-2B Chapter 3.
 - (1) The ELT antenna should be capable of supporting a 100 G load in the plus and minus directions of the three principle axis of the aircraft.

A2.4.8 If required, install and placard a suitably rated circuit breaker or fuse.

- (a) Interconnect the ELT transmitter, remote switch/monitor, antenna and any other associated components in accordance with the manufacturer's installation instructions using the manufacturer-supplied loom where applicable. If the loom is to be locally-manufactured, wire acceptable per FAA AC43.13-1B or equivalent is to be utilised.
- (b) Ensure that the transmitter-antenna coaxial cable is fitted with vibration proof, radio frequency connectors on each end with sufficient excess cable looped at each end, to tolerate some aircraft deformation in a crash without severing it. An excess cable loop held with no more than four small frangible ties will provide a stress relief point for the cable. It is also recommended that the antenna cable be covered with a fire resistant sleeve.

A2.4.9 If the aircraft is fitted with an ELT that accepts an external position input and the aircraft has a GNSS receiver that has an output compatible with the ELT, it is strongly recommended that the GNSS be connected to the ELT.

- (a) Install the interface between the GNSS and the ELT in accordance with the manufacturer's instructions.
- (b) If the wire loom is to be locally-manufactured, wire acceptable per FAA AC43.13-1B or equivalent is to be utilised.
- (c) The wire routing and installation must meet the requirements of FAA AC43.13-1B, Chapter 11.

A2.4.10 If the ELT installation is fitted with a configuration module (usually adjacent to the ELT connector), install the module in accordance with the manufacturer's instructions.

A2.4.11 Replace the access panels removed in paragraph A2.4.3 in accordance with the aircraft manufacturer's maintenance manual.

A2.4.12 Close the ELT circuit breaker or install the fuse.

A2.4.13 Verify the ELT is transmitting the correct identification code. This will usually require the use of an ELT system tester.

A2.4.14 The configuration data stored in the configuration module must be verified as being correct for that particular aircraft.

- (a) Verify the programming configuration module data is correct, and update the data as necessary, in accordance with the manufacturer's instructions.
- (b) If the data is not correct, data in the ELT will be over-written by data from the programming configuration module when it is connected, resulting in an incorrectly configured ELT.
- (c) Carry out a functional test of the ELT in accordance with Part 43, Appendix F, the advisory circular AC43-11, and the manufacturer's installation/operation instructions.
- (d) Checks are also to be carried out to determine satisfactory operation of all disturbed systems, that there is no interference between avionics systems, no effect on the aircraft compass.

A2.5 Certification

A2.5.1 Review the RCCNZ beacon registration documentation and verify the ELT is correctly registered.

A2.5.2 Amend the aircraft's weight and balance records (refer AC43-2).

A2.5.3 Complete or update ELA, retain copy with aircraft and submit copy with documentation (refer AC21-11 & 91-23).

A2.5.4 Amend the aircraft's form CAA 2129 if necessary (refer AC43-10).

A2.5.5 Generate and issue instructions for continued airworthiness (refer paragraph 14.8).

A2.5.6 Insert the equipment operating instructions in the AFM/POH (refer paragraph 14.9).

A2.5.7 Complete form CAA043-01 *Modification Record* and process as described in paragraph 14 of this advisory circular.

A2.5.8 Make a certified statement of release to service in accordance with rule 43.105 as well as detailing the work carried out and conformity with Appendix 2 of this advisory circular.

A3. APPENDIX 3—Installation of ATC Mode 3/A Transponder with Mode C Altitude Reporting

A3.1 Description

A3.1.1 Installation of an FAA TSO-C74 (or equivalent) transponder and/or a TSO-C88 altitude encoder.

A3.2 Applicability

A3.2.1 All limitations of paragraph 2.1 apply.

A3.2.2 Paragraphs 1 to 14 of this advisory circular apply.

A3.3 General

A3.3.1 Part 91, Appendix A.22 (1), requires that all Mode 3/A transponders meet the requirements of TSO-C74.

A3.3.2 Part 91, Appendix A.23, requires that each altitude encoder meets the requirements of TSO-C88.

A3.3.3 Appendix 3 to this advisory circular is divided into two parts.

- (a) Part A – Installation of a transponder
- (b) Part B – Installation of an altitude encoder

A3.4 Technical instructions – Part A (Installation of a Mode 3/A transponder)

A3.4.1 Ensure the aircraft is safe for servicing.

A3.4.2 Remove access panels etc. as required in accordance with the aircraft manufacturer's maintenance manual.

A3.4.3 If an existing transponder is to be removed:

- (a) Open the transponder circuit breaker or remove the transponder fuse, as required, to isolate power from the existing transponder.
- (b) Remove the existing transponder, mounting tray, antenna and wiring as required.

A3.4.4 Install the transponder as follows:

- (a) If the transponder is being installed in a new location, determine a suitable location for the transponder. The transponder should be located in a position which is viewable and accessible to the pilot from his/her normally seated position. The preferred location is a standard aircraft manufacturer-installed avionics rack.
- (b) Install the transponder mounting tray at the location determined in paragraph A3.4.4(a). The installation is to be carried out in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B. The installation should conform to the following requirements.
 - (1) Manufacturer-supplied or standard parts should be used.
 - (2) The transponder mounting should be tested to ensure that the transponder and rack will be restrained throughout the flight envelope.

- (3) Where a modification is required to the aircraft structure to show compliance with paragraph A3.4.4(b)(2), the modification is to be carried out in accordance with the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.

A3.4.5 Install the transponder antenna as follows:

- (a) Determine an approved location for the transponder antenna in accordance with FAA AC43.13-2B or the aircraft manufacturer's instructions. The antenna should not be located within 0.9m of any other antenna.
- (b) Install the transponder antenna in the location determined in paragraph A3.4.5(a), in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B. The transponder antenna installation should be tested to ensure that it will be restrained throughout the flight envelope.

A3.4.6 Install and placard a suitably rated circuit breaker or fuse.

A3.4.7 Interconnect the transponder, altitude encoder and antenna in accordance with the manufacturer's installation instructions. Wire listed in FAA AC43.13-1B, Chapter 11 or equivalent is to be utilised.

A3.4.8 Replace the access panels removed in paragraph A3.4.2 in accordance with the aircraft manufacturer's maintenance manual.

A3.4.9 Close the transponder circuit breaker or install the fuse.

A3.4.10 Carry out a functional test of the transponder in accordance with Part 43, Appendix E, and the manufacturer's installation/operation instructions. A functional test of the transponder/altitude encoder system should be carried out in accordance with Part 43, Appendix D.3, and the manufacturer's installation/operation instructions. Checks are also to be carried out to determine satisfactory operation of all disturbed systems, that there is no interference between avionics systems, no effect on the aircraft compass system and that there is no interference with the aircraft flight controls.

A3.4.11 Amend the aircraft's weight and balance records (refer AC43-2).

A3.4.12 Complete or update ELA, retain copy with aircraft and submit copy with documentation (refer AC21-11 & 91-23).

A3.4.13 Amend the aircraft's form CAA 2129 if necessary (refer AC43-10).

A3.4.14 Generate and issue instructions for continued airworthiness (refer paragraph 14.8).

A3.4.15 Insert the equipment operating instructions in the AFM/POH (refer paragraph 14.9).

A3.4.16 Complete form CAA043-01 *Modification Record* and process as described in paragraph 14 of this advisory circular.

A3.4.17 Make a certified statement of release to service in accordance with rule 43.105, detailing the work carried out and conformity with Appendix 3 to this advisory circular.

A3.5 Technical instructions – Part B (Installation of a Mode C altitude encoder)

A3.5.1 Ensure the aircraft is safe for servicing.

A3.5.2 Remove access panels etc. as required in accordance with the aircraft manufacturer's maintenance manual.

A3.5.3 If an existing altitude encoder is to be removed:

- (a) Open the encoder circuit breaker or remove the encoder fuse, as required, to isolate power from the existing encoder.
- (b) Remove the existing encoder, mounting provisions, and static connections as required. Ensure any unused static lines are blanked and stowed in such a manner so as to prevent a new low point being introduced in the aircraft static system.

A3.5.4 Install the altitude encoder as follows:

- (a) If the encoder is being installed in a new location, determine a suitable location for the encoder. The encoder should be located in a position which is accessible to the aircraft static lines and will not introduce a new low point in the aircraft static system.
- (b) Install the encoder at the location determined in paragraph A3.5.4(a). The installation is to be carried out in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B. The installation should conform to the following requirements.
 - (1) Manufacturer-supplied or standard parts should be used.
 - (2) The encoder installation should be tested to ensure that the encoder will be restrained throughout the flight envelope.
 - (3) Where a modification is required to the aircraft structure to show compliance with paragraph A3.5.4(b)(2), the modification is to be carried out in accordance with the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.
- (c) The encoder is to be connected to the aircraft static system in accordance with the manufacturer's installation instructions using manufacturer-approved connections. No new low point is to be introduced in the aircraft static system.
- (d) Install and placard a suitably rated circuit breaker or fuse.
- (e) Interconnect the altitude encoder and transponder in accordance with the manufacturer's installation instructions. Wire listed in AC43.13-1B, Chapter 11 or equivalent is to be utilised.
- (f) Replace the access panels removed in paragraph A3.5.2 in accordance with the aircraft manufacturer's maintenance manual.
- (g) Close the altitude encoder circuit breaker or install the fuse.
- (h) Carry out a leak test of the aircraft static system in accordance with Part 43, Appendix D.1.
- (i) Carry out a functional test of the transponder/encoder system in accordance with Part 43, Appendix D.3, and the manufacturer's installation/operation instructions. Checks are also to be carried out to determine satisfactory operation of all disturbed systems, that there is no interference between avionics systems, no effect on the aircraft compass system and that there is no interference with the aircraft flight controls.
- (j) Amend the aircraft's weight and balance records (refer AC43-2).
- (k) Complete or update ELA, retain copy with aircraft and submit copy with documentation (refer AC21-11 & 91-23).
- (l) Amend the aircraft's form CAA 2129 if necessary (refer AC43-10).
- (m) Generate and issue instructions for continued airworthiness (refer paragraph 14.8).

- (n) Insert the equipment operating instructions in the AFM/POH (refer paragraph 14.9).
- (o) Complete form CAA043-01 *Modification Record* and process as described in paragraph 14 of this advisory circular.
- (p) Make a certified statement of release to service in accordance with rule 43.105, detailing the work carried out and conformity with Appendix 3 of this advisory circular.

A4. APPENDIX 4—Installation of Stand-alone GPS Equipment

A4.1 Description

A4.1.1 Installation of a stand-alone GPS system used for en-route VFR navigation, or as an ADS-B system external GNSS position source; noting that this specifically excludes GPS units optimised for specialist applications, such as agriculture operations.

A4.2 Applicability

A4.2.1 All limitations of paragraph 2.1 apply.

A4.2.2 Paragraphs 1 to 14 of this advisory circular apply.

A4.3 General & Limitations

A4.3.1 Appendix 4 to this advisory circular provides installation instructions for stand-alone GPS systems used for en-route, VFR navigation only, noting that this specifically excludes GPS units optimised for specialist applications, such as agriculture operations. The GPS deviation signal is not to be switched to a remote indicator or coupled to an autopilot. The GPS deviation signal may be directly coupled to a dedicated remote indicator.

A4.3.2 An ADS-B system-dedicated external GNSS position source may only be installed in accordance with this Appendix 4 in conjunction with Appendix 13 of this advisory circular.

A4.3.3 GPS systems installed for other purposes require approval, via either a form CAA337 or supplemental type certificate, and are beyond the scope of this advisory circular.

A4.4 Technical Instructions

A4.4.1 Ensure the aircraft is safe for servicing.

A4.4.2 Remove access panels etc. as required in accordance with the aircraft manufacturer's maintenance manual.

A4.4.3 Install the GPS as follows:

- (a) Determine a suitable location for the GPS. The GPS should be located in a position which is viewable and accessible to the pilot from his/her normally seated position. The installed GPS should not:
 - (1) restrict access to or view of any control, display or indicator; or
 - (2) restrict movement of the flight controls; or
 - (3) interfere with the pilot's vision along the flight path; or
 - (4) restrict pilot/passenger egress.
- (b) Install the GPS at the location determined in paragraph A4.4.3(a). The installation is to be carried out in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B. The installation should conform to the following requirements:
 - (1) Manufacturer-supplied or standard parts should be used.
 - (2) If a 'non-standard' method of installation is utilised, for example: velcro, the manufacturer's recommended procedures are to be followed.
 - (3) The GPS mounting should be tested to ensure that it will be restrained throughout the flight envelope.

- (4) Where a modification is required to the aircraft structure to show compliance with paragraph A4.4.3(b)(3), the modification is to be carried out in accordance with the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.

A4.4.4 If required, install a remote GPS antenna as follows:

- (a) Determine a suitable location for the GPS antenna on the upper fuselage. The antenna should not be located within 1.1m of any other antenna. Particular care should be taken to ensure that at least the minimum separation is maintained between the GPS antenna and VHF communications and ELT antennas.
- (b) Install the manufacturer-approved GPS antenna in the location determined in paragraph A4.4.4(a), in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B. The GPS antenna installation should be tested to ensure that it will be restrained throughout the flight envelope.
- (c) If using an internally-mounted, manufacturer-supplied remote antenna, install the antenna in accordance with the manufacturer's installation instructions. Ensure that the antenna and associated cable will not interfere with pilot's vision, aircraft controls or displays, or pilot/passenger egress.

A4.4.5 If the GPS is to be connected to the aircraft power supply, install and placard an appropriately rated circuit breaker or fuse.

A4.4.6 If required, install a remote GPS indicator as follows.

- (a) Determine a suitable location for the GPS indicator. The indicator should be located in the instrument panel and readily viewable to the pilot from his/her normally seated position.
- (b) Install the indicator in the location determined in paragraph A4.4.6(b), in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.

A4.4.7 Interconnect the GPS, power supply, indicator and antenna (as required) in accordance with the manufacturer's installation instructions. Aeronautical wire per FAA AC43.13-1B or equivalent is to be utilised.

A4.4.8 Replace the access panels removed in paragraph A4.4.2 in accordance with the aircraft manufacturer's maintenance manual.

A4.4.9 For systems that may be used for navigation, install the following placard in the vicinity of the GPS and in clear view of the pilot:

GPS APPROVED FOR VFR USE ONLY

A4.4.10 Close the GPS circuit breaker or install the fuse.

A4.4.11 Carry out a functional test of the GPS installation in accordance with the manufacturer's installation/operation instructions. Checks are also to be carried out to determine satisfactory operation of all disturbed systems, that there is no interference between avionics systems, no effect on the aircraft compass system and that there is no interference with the aircraft flight controls.

A4.4.12 Amend the aircraft's weight and balance records (refer AC43-2).

A4.4.13 Complete or update ELA, retain copy with aircraft and submit copy with documentation (refer AC21-11 & 91-23).

A4.4.14 Amend the aircraft's form CAA 2129 if necessary (refer AC43-10).

A4.4.15 Generate and issue instructions for continued airworthiness (refer paragraph 14.8).

A4.4.16 Insert the equipment operating instructions in the AFM/POH (refer paragraph 14.9).

A4.4.17 Complete form CAA043-01 *Modification Record* and process as described in paragraph 14 of this advisory circular.

A4.4.18 Make a certified statement of release to service in accordance with rule 43.105, detailing the work carried out and conformity with Appendix 4 to this advisory circular.

A5. APPENDIX 5—Installation of Audio Panel and Intercoms

A5.1 Description

A5.1.1 Installation of audio panel and intercom systems.

A5.2 Applicability

A5.2.1 All limitations of paragraph 2.1 apply.

A5.2.1 Paragraphs 1 to 14 of this advisory circular apply.

A5.3 General

A5.3.1 Appendix 5 to this advisory circular covers the procedures to be carried out when installing audio panel and intercom equipment.

A5.3.2 Consideration must be taken into account on whether the aircraft is to be operated under IFR or VFR and the approval level of the equipment to be installed (refer advisory circular AC43-10).

- (a) For aircraft operating under IFR, the audio panel and intercom should be approved to level 1. A Level 2 or level 3 intercom may be used if the audio system can be configured to connect the pilot's microphone and headset directly to the level 1 audio panel or the VHF. This could be accomplished by the provision of emergency jacks.
- (b) For aircraft operating under VFR, the audio panel and intercom should be approved to level 1 or level 2. A level 3 intercom may be used if the audio system can be configured to connect the pilot's microphone and headset directly to the level 1 or level 2 audio panel or the VHF. This could be accomplished by the provision of emergency jacks.

A5.4 Technical instructions

A5.4.1 Ensure the aircraft is safe for servicing.

A5.4.2 Open the circuit breakers and/or remove the fuses for any equipment that is to be interfaced with the audio panel and/or intercom to be installed.

A5.4.3 Remove access panels etc. as required in accordance with the aircraft manufacturer's maintenance manual.

A5.4.4 Determine a suitable location(s) for the audio panel, intercom and headset/microphone jacks (as required) to be installed. Consideration should be given to:

- (a) accessibility and visibility of the equipment to the pilot
- (b) required operating environment for the equipment
- (c) required structural mounting provisions
- (d) no possibility of head-strike on the installed equipment for crew or passengers
- (e) no restriction during emergency egress.

A5.4.5 Install the equipment in the location(s) determined in paragraph A5.4.4. The installation is to be carried out in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B. The installation should be tested to ensure that it will be restrained throughout the flight envelope.

- A5.4.6 Interconnect the audio system, intercom and associated transmitters/receivers (as required) in accordance with the relevant manufacturer's installation instructions. Wire listed in advisory circular FAA AC43.13-1B, Chapter 11 or equivalent is to be utilised.
- A5.4.7 Replace the access panels removed in paragraph A5.4.3 in accordance with the aircraft manufacturer's maintenance manual.
- A5.4.8 Close the audio panel/intercom circuit breaker or install the fuse.
- A5.4.9 Close the circuit breakers and/or install the fuses opened/removed in paragraph A5.4.2.
- A5.4.10 Post installation tests are to be carried out in accordance with the manufacturer's installation/operations manual to determine satisfactory operation of the installed equipment. Checks are also to be carried out to determine satisfactory operation of all disturbed systems, that there is no interference between avionics systems, no effect on the aircraft compass system and no interference with the aircraft flight controls. A check is also to be carried out to determine satisfactory fail-safe operation of the VHF in the event of an audio panel or intercom failure.
- A5.4.11 Amend the aircraft's weight and balance records (refer AC43-2).
- A5.4.12 Complete or update ELA, retain copy with aircraft and submit copy with documentation (refer AC21-11 & 91-23).
- A5.4.13 Amend the aircraft's form CAA 2129, if necessary (refer AC43-10).
- A5.4.14 Generate and issue instructions for continued airworthiness (refer paragraph 14.8).
- A5.4.15 Insert the equipment operating instructions in the AFM/POH (refer paragraph 14.9).
- A5.4.16 Complete form CAA043-01 *Modification Record* and process as described in paragraph 14 of this advisory circular.
- A5.4.17 Make a certified statement of release to service in accordance with rule 43.105, detailing the work carried out and conformity with Appendix 5 to this advisory circular.

A6. APPENDIX 6—Installation of VHF Radio Communications

A6.1 Description

A6.1.1 Installation of an aeronautical VHF transceiver.

A6.2 Applicability

A6.2.1 All limitations of paragraph 2.1 apply.

A6.2.2 Paragraphs 1 to 14 of this advisory circular apply.

A6.3 General

A6.3.1 This appendix provides installation instructions for aeronautical VHF transceivers. The transceivers must meet the appropriate approval level for the intended type of operation as required by Part 91, Appendix A9(a).

A6.3.2 For IFR operations the VHF must be approved to level 1 and for VFR operations approved to either level 1 or level 2. Approval levels for commonly used equipment are detailed in advisory circular AC43-10.

A6.4 Technical instructions

A6.4.1 Ensure the aircraft is safe for servicing.

A6.4.2 Remove access panels etc. as required in accordance with the aircraft manufacturer's maintenance manual.

A6.4.3 Install the VHF as follows.

- (a) Determine a suitable location for the VHF. The VHF should be located in a position that is viewable and accessible to the pilot from his/her normally seated position. The installed VHF should not:
 - (1) restrict access to or view of any control, display or indicator; or
 - (2) restrict movement of the flight controls; or
 - (3) interfere with the pilot's vision along the flight path; or
 - (4) restrict pilot/passenger egress.
- (b) Install the VHF at the location determined in paragraph A6.4.3(a). The installation is to be carried out in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B. The installation should conform to the following requirements.
 - (1) Manufacturer-supplied or standard parts should be used.
 - (2) The VHF mounting should be tested to ensure that the VHF and rack will be restrained throughout the flight envelope.
 - (3) Where a modification is required to the aircraft structure to show compliance with paragraph A6.4.3(b)(2), the modification is to be carried out in accordance with the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.
- (c) If required, install an antenna as follows.
 - (1) Determine a suitable location for the VHF antenna. Antennas should be installed in accordance with FAA AC43-13.2B, chapter 3 or aircraft manufacturer approved locations. The antenna is not to be installed within 0.9m of any other antenna. If an antenna is to be installed in other than an approved location, post-installation

ground and flight tests are to be carried out to confirm the suitability of the antenna location.

- (2) Install the manufacturer-approved VHF antenna in the location determined in paragraph A6.4.3(c)(1), in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-2B. The VHF antenna installation should be tested to ensure that it will be restrained throughout the flight envelope.

A6.4.4 Install and placard an appropriately rated circuit breaker or fuse.

A6.4.5 Interconnect the VHF, power supply, audio panel and intercom (as required) in accordance with the manufacturer's installation instructions. Wire listed in AC43.13-1B, Chapter 11 or equivalent is to be utilised.

A6.4.6 Replace the access panels removed in paragraph A6.4.2 in accordance with the aircraft manufacturer's maintenance manual.

A6.4.7 Close the VHF circuit breaker or install the fuse.

A6.4.8 Carry out a functional test of the VHF installation in accordance with the manufacturer's installation/operation instructions and Part 43, Appendix B. Checks are also to be carried out to determine satisfactory operation of all disturbed systems, that there is no interference between avionics systems, no effect on the aircraft compass system and that there is no interference with the aircraft flight controls. For aircraft approved for night operations, ensure that the equipment lighting is satisfactory and that there are no unwanted reflections present.

A6.4.9 Amend the aircraft's weight and balance records (refer AC43-2).

A6.4.10 Complete or update ELA, retain copy with aircraft and submit copy with documentation (refer AC21-11 & 91-23).

A6.4.11 Amend the aircraft's form CAA 2129, if necessary (refer AC43-10).

A6.4.12 Generate and issue instructions for continued airworthiness (refer paragraph 14.8).

A6.4.13 Insert the equipment operating instructions in the AFM/POH (refer paragraph 14.9).

A6.4.14 Complete form CAA043-01 *Modification Record* and process as described in paragraph 14 of this advisory circular.

A6.4.15 Make a certified statement of release to service in accordance with rule 43.105, detailing the work carried out and conformity with Appendix 6 to this advisory circular.

A7. APPENDIX 7—Installation of VHF Radio Navigation Receivers and Distance Measuring Equipment

A7.1 Description

A7.1.1 Installation of an aeronautical VHF navigation receiver, indicator and distance measuring equipment (DME).

A7.2 Applicability

A7.2.1 All limitations of paragraph 2.1 apply.

A7.2.2 Paragraphs 1 to 14 of this advisory circular apply.

A7.3 General

A7.3.1 This appendix provides installation instructions for aeronautical VHF navigation receivers, an associated indicator and DME systems. The receiver, indicator and DME must meet the appropriate approval level for the intended type of operation as required by Part 91, Appendix A9(a).

A7.3.2 For IFR operations the equipment must be approved to level 1. Approval levels for commonly used equipment are detailed in advisory circular AC43-10.

A7.4 Technical instructions

A7.4.1 Ensure the aircraft is safe for servicing.

A7.4.2 Remove access panels etc. as required in accordance with the aircraft manufacturer's maintenance manual.

A7.4.3 Install the navigation receiver or DME as follows.

- (a) Determine suitable locations for the receiver, DME and indicator. The receiver and DME should be located in a position which is viewable and accessible to the pilot from his/her normally seated position. If required for approach navigation, the indicator should be located in the pilot's primary field-of-view so that the indicator is viewable by the pilot when looking along the aircraft's flight path. The installed receiver, DME and indicator should not:
 - (1) restrict access to or view of any control, display or indicator; or
 - (2) restrict movement of the flight controls; or
 - (3) interfere with the pilot's vision along the flight path; or
 - (4) restrict pilot/passenger egress.
- (b) Install the receiver, DME and indicator at the locations determined in paragraph A7.4.3(a). The installations are to be carried out in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B. The installations should conform to the following requirements.
 - (1) Manufacturer-supplied or standard parts should be used.
 - (2) The equipment mounting should be tested to ensure that the receiver, indicator and associated rack(s) would be restrained throughout the flight envelope.
 - (3) Where a modification is required to the aircraft structure to show compliance with paragraph A7.4.3(b)(2), the modification is to be carried out in accordance with the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.

A7.4.4 If required, install an antenna as follows.

- (a) Determine a suitable location for the antenna. Antennas should be installed in accordance with FAA AC43.13-2B Chapter 3, or aircraft manufacturer approved locations. The antenna is not to be installed within 0.9m of any other antenna. If an antenna is to be installed in other than an approved location, post-installation ground and flight tests are to be carried out to determine the suitability of the antenna location.
- (b) Install the manufacturer-approved antenna in the location determined in paragraph A7.4.4(a) in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-2B, Chapter 3. The antenna installation should be tested to ensure that it will be restrained throughout the flight envelope.

A7.4.5 Install and placard an appropriately rated circuit breaker or fuse.

A7.4.6 Interconnect the navigation receiver, DME, power supply, navigation indicator and audio panel (as required) in accordance with the manufacturer's installation instructions. Wire listed in FAA AC43.13-1B, Chapter 11 or equivalent is to be utilised.

A7.4.7 Replace the access panels removed in paragraph A7.4.2 in accordance with the aircraft manufacturer's maintenance manual.

A7.4.8 Close the receiver circuit breaker or install the fuse.

A7.4.9 Carry out a functional test of the navigation receiver installation in accordance with the manufacturer's installation/operation instructions and Part 43, Appendix B. Checks are also to be carried out to determine satisfactory operation of all disturbed systems, that there is no interference between avionics systems, no effect on the aircraft compass system and that there is no interference with the aircraft flight controls. For aircraft approved for night operations, ensure that the equipment lighting is satisfactory and that there are no unwanted reflections present.

A7.4.10 Amend the aircraft's weight and balance records (refer AC43-2).

A7.4.11 Complete or update ELA, retain copy with aircraft and submit copy with documentation (refer AC21-11 & 91-23).

A7.4.12 Amend the aircraft's form CAA 2129, if necessary (refer AC43-10).

A7.4.13 Generate and issue instructions for continued airworthiness (refer paragraph 14.8).

A7.4.14 Insert the equipment operating instructions in the AFM/POH (refer paragraph 14.9).

A7.4.15 Complete form CAA043-01 *Modification Record* and process as described in paragraph 14 of this advisory circular

A7.4.16 Make a certified statement of release to service in accordance with rule 43.105, detailing the work carried out and conformity with Appendix 7 to this advisory circular.

A8. APPENDIX 8—Installation of Voltage Converters

A8.1 Description

A8.1.1 Installation of voltage converters.

A8.2 Applicability

A8.2.1 All limitations of paragraph 2.1 apply.

A8.2.2 Paragraphs 1 to 14 of this circular apply.

A8.3 General

A8.3.1 Appendix 8 to this advisory circular covers the procedures to be carried out when installing voltage converters.

A8.3.2 The procedure is only applicable for installations which can be installed on a 'no hazard, no interference' basis. If comprehensive testing or analysis is required, the modification documentation is to be submitted for approval, using a form CAA337, to either the CAA or a certificated Part 146 design organisation.

A8.3.3 When using this procedure, the following points should be observed.

- (a) The equipment is to be suitable for use in aircraft. Examples of items to be considered are:
 - (1) the operating environment
 - (2) structural integrity of the equipment throughout the flight envelope
 - (3) flammability requirements.
- (b) The equipment should be suitable for the intended purpose. The equipment must be compatible with other systems on the aircraft. If the equipment interfaces with other systems, for example: power supplies, audio panel, intercom units etc., it must not affect the operation of the other systems.
- (c) The equipment must not present a hazard either by its:
 - (1) construction; or
 - (2) installation; or
 - (3) interface; or
 - (4) operation.
- (d) If being used to provide power for required IFR equipment (e.g. VHF communication or navigation equipment) then the voltage converter must be level 1 approved.

A8.4 Technical instructions

A8.4.1 Ensure the aircraft is safe for servicing.

A8.4.2 Remove access panels etc. as required in accordance with the aircraft manufacturer's maintenance manual.

A8.4.3 Determine a suitable location for the voltage converter. Consideration should be given to:

- (a) required operating environment for the equipment
- (b) any cooling requirements for the voltage converter
- (c) required structural mounting provisions.

A8.4.4 Install the equipment in the location determined in paragraph A8.4.3. The installation is to be carried out in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B. The installation should be tested to ensure that it will be restrained throughout the flight envelope.

A8.4.5 Electrically connect the voltage converter in accordance with the manufacturer's installation instructions and the aircraft maintenance manual. The voltage converter is to be powered via an appropriately rated, placarded circuit protective device. Wire listed in FAA AC43.13-1B, Chapter 11 or equivalent is to be utilised.

A8.4.6 Replace any access panels removed in paragraph A8.4.2.

A8.4.7 Post installation tests are to be carried out to determine satisfactory operation of the installed equipment. Checks are also to be carried out to determine satisfactory operation of all disturbed systems, that there is no interference between avionics systems, no effect on the aircraft compass system and no interference with the aircraft flight controls.

A8.4.8 Amend the aircraft's weight and balance records (refer AC43-2).

A8.4.9 Complete or update ELA, retain copy with aircraft and submit copy with documentation (refer AC21-11 & 91-23).

A8.4.10 Amend the aircraft's form CAA 2129, if necessary (refer AC43-10).

A8.4.11 Generate and issue instructions for continued airworthiness (refer paragraph 14.8).

A8.4.12 Insert the equipment operating instructions in the AFM/POH (refer paragraph 14.9).

A8.4.13 Complete form CAA043-01 *Modification Record* and process as described in paragraph 14 of this advisory circular.

A8.4.14 Make a certified statement of release to service in accordance with rule 43.105, detailing the work carried out and conformity with Appendix 8 to this advisory circular.

A9. APPENDIX 9—Installation of ‘Non-Aeronautical’ Electronics Equipment

A9.1 Description

A9.1.1 Installation of ‘non-aeronautical’ electronics equipment.

A9.2 Applicability

A9.2.1 All limitations of paragraph 2.1 apply.

A9.2.2 Paragraphs 1 to 14 of this advisory circular apply.

A9.3 General

A9.3.1 Appendix 9 to this advisory circular covers the procedures to be carried out when installing ‘non-aeronautical’ electronics equipment. Examples of non-aeronautical electronics equipment covered by this Appendix are:

- (a) cellular telephones
- (b) audio entertainment systems
- (c) FM transceivers.

A9.3.2 The procedure is only applicable for installations which can be installed on a ‘no hazard, no interference’ basis. If extensive testing or analysis is required, the modification documentation is to be submitted for approval, using a form CAA337, to either the CAA or a certificated Part 146 design organisation.

A9.3.3 When using this procedure, the following points should be observed.

- (a) The equipment is to be suitable for use in aircraft. Examples of aspects to be considered when determining this are:
 - (1) the operating environment
 - (2) structural integrity of the equipment throughout the flight envelope
 - (3) ability of the antenna installation to withstand aerodynamic loads
 - (4) flammability requirements.
- (b) The equipment should be suitable for the intended purpose. The equipment must have the required functionality and be suitable for operation in aircraft by crew or passengers as applicable. The equipment must also be compatible with other systems on the aircraft. If the equipment interfaces with other systems, for example: power supplies, audio panel, intercom units etc., it must not affect the operation of the other systems.
- (c) The equipment must not present a hazard either by its:
 - (1) construction; or
 - (2) installation; or
 - (3) interface; or
 - (4) operation.
- (d) Installed cellular telephones are to be:
 - (1) approved for connection to any NZ cellular network only
 - (2) disabled during approach and take-off when operating under IFR.

- (e) The installed equipment should be compatible. For example:
 - (1) an antenna being utilised must be suitable for the intended purpose and matched to the transceiver with which it is being used
 - (2) if installing a radio it must be compatible with the aircraft audio system.

A9.4 Technical instructions

A9.4.1 Ensure the aircraft is safe for servicing.

A9.4.2 Remove access panels etc. as required in accordance with the aircraft manufacturer's maintenance manual.

A9.4.3 Determine a suitable location(s) for all equipment to be installed. Consideration should be given to:

- (a) accessibility and visibility of the equipment to the pilot
- (b) required operating environment for the equipment
- (c) required structural mounting provisions
- (d) no possibility of head-strike on the installed equipment for crew or passengers
- (e) no restriction during emergency egress.

A9.4.4 Install the equipment in the location(s) determined in paragraph A9.4.3. The installation is to be carried out in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B. The installation should be tested to ensure that it will be restrained throughout the flight envelope.

A9.4.5 Electrically connect the equipment in accordance with the manufacturer's installation instructions and the aircraft maintenance manual. The equipment is to be powered via an appropriately rated, placarded circuit protective device. Wire listed in FAA AC43.13-1B Chapter 11 or equivalent is to be utilised.

A9.4.6 Antennas should be installed in accordance with FAA AC43.13-2B Chapter 3 or aircraft manufacturer approved locations. If an antenna is to be installed in other than an approved location:

- (a) the antenna is not to be installed within 0.9m of another antenna
- (b) post-installation ground and flight tests are to be carried out to confirm the suitability of the antenna location.

A9.4.7 Replace any access panels removed in paragraph A9.4.2.

A9.4.8 Post installation ground and, if required, flight tests are to be carried out to determine satisfactory operation of the installed equipment. Checks are also to be carried out to determine satisfactory operation of all disturbed systems, that there is no interference between avionics systems, no effect on the aircraft compass system and no interference with the aircraft flight controls.

A9.4.9 Amend the aircraft's weight and balance records (refer AC43-2).

A9.4.10 Complete or update ELA, retain copy with aircraft and submit copy with documentation (refer AC21-11 & 91-23).

A9.4.11 Amend the aircraft's form CAA 2129, if necessary (refer AC43-10).

A9.4.12 Generate and issue instructions for continued airworthiness (refer paragraph 14.8).

A9.4.13 Insert the equipment operating instructions in the AFM/POH (refer paragraph 14.9).

A9.4.14 Complete form CAA043-01 *Modification Record* and process as described in paragraph 14 of this advisory circular.

A9.4.15 Make a certified statement of release to service in accordance with rule 43.105, detailing the work carried out and conformity with Appendix 9 to this advisory circular.

A10. APPENDIX 10—Installation of 12VDC Electrical Distribution System for Gliders

A10.1 Description

A10.1.1 Installation of a 12VDC electrical distribution system in gliders where no electrical system has been provided by the manufacturer.

A10.2 Applicability

A10.2.1 All gliders without a 12VDC electrical system installed by the glider's manufacturer where the modification is not classified as a major modification.

A10.2.2 Paragraphs 1 to 14 of this advisory circular apply.

A10.3 General

A10.3.1 Appendix 10 to this advisory circular provides installation instructions for a 12VDC electrical distribution system in a glider and does not provide for the installation of a battery. This appendix assumes that the installed battery is, or batteries are, appropriately rated for the maximum electrical load of the distribution system.

A10.3.2 If required, the installation of a battery should be carried out in accordance with a modification approved by either:

- (a) the glider manufacturer; or
- (b) the CAA; or
- (c) a certificated Part 146 design organisation.

A10.3.3 This modification will result in the installation of the following electrical system components:

A10.3.4 A **master switch** located on the instrument panel. When in the OFF position, the switch must electrically isolate the battery from all other components and instruments. The switch should be of aeronautical quality and appropriately rated for the maximum electrical load.

A10.3.5 A **master circuit breaker**. An electrical load analysis of the instruments and equipment to be powered from the distribution system should be carried out to determine the maximum load. The master circuit breaker should be rated to 1.5 times the maximum load.

A10.3.6 **In-line fusing** of both the positive and negative wires, located as close as practical to the battery. The fuse in the positive line of each battery should be double the value of the circuit breaker, and the fuse in the negative line of each battery should be double the value of the fuse in the positive line. This fusing is compliant with DCA/ELECT/8 requirements for composite and wooden airframes.

A10.3.7 A **terminal block** to terminate the supply and allow multiple distribution to the equipment requiring power. The terminal block should be suitable for use in aeronautical applications.

A10.3.8 **Aeronautical mil spec wire**. Two mil spec wires from a single battery, and three mil spec wires from dual battery sources are to be installed. Wires are to be sized by using the intermittent rating chart in FAA AC43.13-1B, Chapter 11.

A10.4 Technical instructions

A10.4.1 Ensure the glider is safe for servicing.

A10.4.2 Remove access panels as required in accordance with the glider manufacturer's maintenance manual to afford access for the running of wires and the installation of electrical components.

A10.4.3 Determine suitable locations for the master switch, circuit breaker and terminal block.

- The master switch is to be located in the instrument panel in a position which is readily accessible and viewable to the pilot.
- The master circuit breaker is to be located in a position that is viewable and accessible to the pilot from his or her normally seated position.
- The terminal block is to be located in a position forward of the instrument panel where the terminals will not contact the pilot or any structure, components or controls.

A10.4.4 Install the master switch, circuit breaker and terminal block in the positions determined in paragraph A10.4.3 in accordance with the relevant manufacturers' instructions and the guidelines in FAA AC43.13-1B.

A10.4.5 Route and connect wiring in accordance with Figure 1.

- Wire listed in FAA AC43.13-1B Chapter 11 as specified in paragraph A10.3.13 is to be utilised.
- Connect the supply lines from the battery via a polarised connector to ensure that the battery, or batteries, cannot be connected in such a way as to apply reverse polarity to the distribution system.
- The master circuit breaker and battery fuses should be rated as determined in paragraphs A10.3.10 and A10.3.11.
- Cable routing is to be in accordance with FAA AC43.13-1B, Chapter 11.

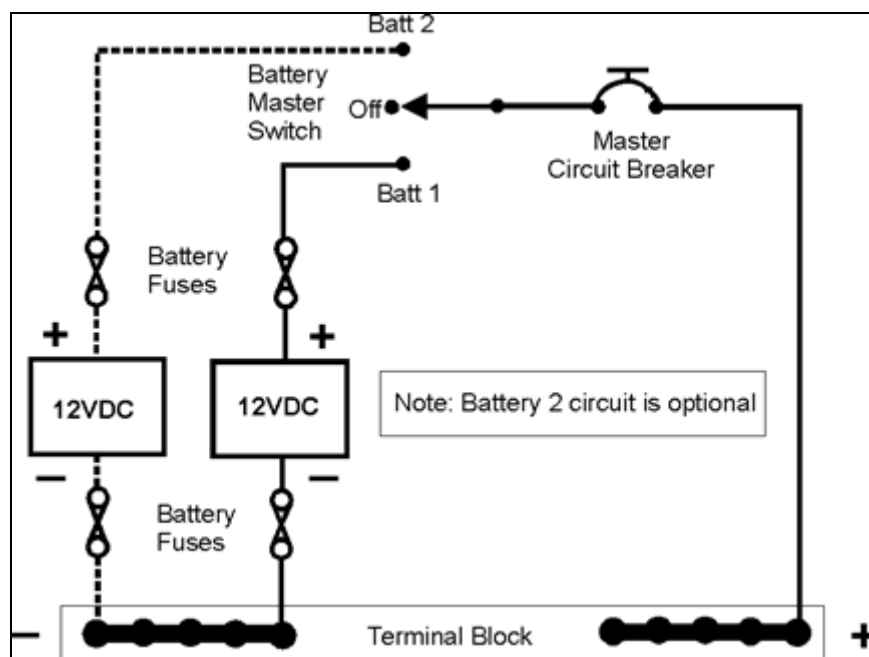


Figure 1

A10.4.6 Placard the master switch, master circuit breaker, battery fuses and terminal block.

A10.4.7 Replace any access panels removed in paragraph A10.4.2.

A10.4.8 Post installation ground tests are to be carried out to determine satisfactory operation of the electrical distribution system. Checks are to be carried out to determine the correct polarity voltage of the distribution system and satisfactory operation of the master switch. Checks are also to be carried out to determine satisfactory operation of all disturbed systems, that there is no interference between avionics systems, no effect on the glider compass and no interference with the flight controls.

A10.4.9 Amend the aircraft's weight and balance records (refer AC43-2).

A10.4.10 Complete or update ELA, retain copy with aircraft and submit copy with documentation (refer AC21-11 & 91-23).

A10.4.11 Generate and issue instructions for continued airworthiness (refer paragraph 14.8).

A10.4.12 A circuit diagram of the electrical system should be inserted into the maintenance subsection of the flight manual, with the note that the system is to be maintained in accordance with the current approved maintenance program for the glider (refer paragraph 14.9).

A10.4.13 Complete form CAA043-01 *Modification Record* and process as described in paragraph 14 of this advisory circular.

A10.4.14 Make a certified statement of release to service in accordance with rule 43.105, detailing the work carried out and conformity with Appendix 10 to this advisory circular.

A11. APPENDIX 11—Removal of Avionics Systems

A11.1 Description

A11.1.1 Removal of avionics systems.

A11.2 Applicability

A11.2.1 All limitations of paragraph 2.1 apply.

A11.2.2 Paragraphs 1 to 14 of this advisory circular apply.

A11.3 General

A11.3.1 Appendix 11 to this advisory circular covers the procedures to be carried out when removing avionics equipment.

A11.4 Technical instructions

A11.4.1 Ensure the aircraft is safe for servicing.

A11.4.2 Remove access panels etc. as required in accordance with the aircraft manufacturer's maintenance manual.

A11.4.3 Open the circuit breaker(s) or remove the fuse(s) for the system to be removed.

A11.4.4 Remove the equipment and associated racks, wiring, switches, indicators, antennas, circuit breakers, fuses and antennas as required.

A11.4.5 Any retained indicators or switches should be placarded 'inoperative' as applicable.

A11.4.6 Any retained wiring looms should be bagged, stowed and secured as applicable.

A11.4.7 Any holes (equipment, instrument, switch, antenna mounting holes etc.) are to be blanked as applicable. The holes are to be blanked in accordance with aircraft maintenance manual and the guidelines in FAA AC43.13-1B.

A11.4.8 Replace any access panels removed in paragraph A11.4.2.

A11.4.9 Checks are to be carried out to determine satisfactory operation of all disturbed systems, that there is no interference between avionics systems, no degradation of earthing or bonding, no effect on the aircraft compass system and no interference with the aircraft flight controls.

A11.4.10 Amend the aircraft's weight and balance records (refer AC43-2).

A11.4.11 Complete or update ELA, retain copy with aircraft and submit copy with documentation (refer AC21-11 & 91-23).

A11.4.12 Amend the aircraft's form CAA 2129, if necessary (refer AC43-10).

A11.4.13 Generate and issue/remove/amend instructions for continued airworthiness (refer paragraph 14.8).

A11.4.14 Remove/amend the equipment operating instructions in the AFM/POH (refer paragraph 14.9).

A11.4.15 Complete form CAA043-01 *Modification Record* and process as described in paragraph 14 of this advisory circular.

A11.4.16 Make a certified statement of release to service in accordance with rule 43.105, detailing the work carried out and conformity with this Appendix 11 to this advisory circular.

A12. APPENDIX 12—Installation of Situation Awareness Equipment for Gliders

A12.1 Description

A12.1.1 Installation of situation awareness equipment e.g. FLARM into gliders.

A12.2 Applicability

A12.2.1 All gliders with a 12VDC electrical system installed where the modification is not classified as a major modification.

A.12.2.2 Paragraphs 1 to 14 of this advisory circular apply.

A12.3 General

A12.3.1 Appendix 12 to this advisory circular provides for the installation of situation awareness equipment into gliders and connection to the glider 12 VDC electrical distribution system.

A12.3.2 The FLARM equipment should be installed in accordance with:

- (a) the equipment manufacturer's installation manual.
- (b) FAA AC43-13-1B standard practices.

A12.3.3 If the FLARM equipment requires the use of the external GPS antenna, this should be installed in accordance with Appendix 4 of this advisory circular and the manufacturer's instructions.

A12.4 Technical instructions

A12.4.1 Ensure the glider is safe for servicing.

A12.4.2 Remove access panels etc. as required in accordance with the glider manufacturer's maintenance manual.

A12.4.3 Determine a suitable location for all equipment to be installed. Consideration should be given:

- (a) to accessibility and visibility of the equipment to the pilot
- (b) to required operating environment for the equipment
- (c) to required structural mounting provisions
- (d) that no possibility of head-strike exists on the installed equipment for crew or passengers
- (e) no restriction during emergency egress
- (f) does not obscure any other essential instrument displays.

A12.4.4 Install the equipment in the location(s) determined in paragraph A12.4.3. The installation is to be carried out in accordance with the manufacturer's installation instructions, the glider maintenance manual and the guidelines in FAA AC43.13-1B. Use manufacturer supplied parts when provided. The installation should be tested to ensure that it will be restrained throughout the flight envelope.

A12.4.5 Electrically connect the equipment in accordance with the manufacturer's installation instructions and the aircraft maintenance manual. The equipment is to be powered via an independent, appropriately rated, and placarded circuit protective device. Suitable aeronautical wire listed in FAA AC43.13-1B, Chapter 11 or equivalent is to be utilised.

A12.4.6 Replace any access panels removed in paragraph A12.4.2.

A12.4.7 Test the system in accordance with the manufacturer's instructions. Verify that:

- (a) the software loaded into the system is the current version
- (b) the FLARM does not cause interference to other installed equipment
- (c) equipment installed in the glider do not cause interference with the situation awareness equipment.

A12.4.8 Amend the aircraft's weight and balance records (refer AC43-2).

A12.4.9 Complete or update ELA, retain copy with aircraft and submit copy with documentation (refer AC21-11 & 91-23).

A12.4.10 Amend the aircraft's form CAA 2129, if necessary (refer AC43-10).

A12.4.11 Generate and issue instructions for continued airworthiness (refer paragraph 14.8).

A12.4.12 Insert the equipment operating instructions in the AFM/POH (refer paragraph 14.9).

A12.4.13 Complete form CAA043-01 *Modification Record* and process as described in paragraph 14 of this advisory circular.

A12.4.14 Make a certified statement of release to service in accordance with rule 43.105, detailing the work carried out and conformity with Appendix 12 to this advisory circular.

A13. APPENDIX 13—Installation of Stand-alone ADS-B Systems

A13.1 Description

A13.1.1 Installation of an FAA TSO-C166b transponder, with integral or dedicated external (“blind”) GNSS position source meeting FAA TSO-C145(); and a TSO-C88() altitude encoder.

A13.2 Applicability

A13.2.1 ADS-B systems to be installed under this advisory circular are:

- (a) covered by an approved model list-supplemental type certificate (AML-STC), where the aircraft model is not included in the AML or eligibility list of the STC
- (b) where the AML-STC is for an aircraft of similar construction and type (e.g. normal category fixed-wing all-metal aircraft, or small composite rotorcraft) (refer to paragraph A13.3.4 (a) through (c) for examples of how this applies).

A13.2.2 The intent of this appendix is to address installation of systems to aircraft not on the approval model list.

A13.2.3 Paragraphs 1 to 14 of this advisory circular apply.

A13.3 Limitations

A13.3.1 This advisory circular does not apply to ADS-B systems that interface with traffic advisory or traffic avoidance systems.

A13.3.2 All limitations of paragraph 2.1 apply.

A13.3.3 This advisory circular only applies to stand-alone ADS-B systems, i.e. equipment that includes both a Mode S transponder with extended squitter, and a GNSS position source within a single physical unit, or an external (“blind”) GNSS position source approved by the transponder OEM and dedicated to the ADS-B system. The GNSS source may not interface to other systems.

A13.3.4 This advisory circular only applies to those systems approved by an AML-STC, where the aircraft model is not included by the AML, where the STC is applicable to an aircraft of similar construction and type that would otherwise be considered acceptable to the Director. This is to ensure that the equipment installation data is appropriate and the equipment is qualified for the environmental (e.g. vibration, HIRF, EMI/EMC) conditions to be expected during normal operation. For example:

- (a) If the STC is approved on FAR 23 certified aircraft – the equipment may be installed on other similar fixed-wing aircraft of the same general construction, under this appendix, provided all other requirements are met.
- (b) If the STC is approved on FAR 27 certified rotorcraft – the equipment may be installed on other similar small rotorcraft of the same general construction, under this appendix, provided all other requirements are met.
- (c) If the STC is approved on FAR 29 certified rotorcraft – the equipment may be installed on other similar rotorcraft of the same general construction, under this appendix, provided all other requirements are met.
- (d) Equipment only approved on a fixed-wing aircraft cannot be installed on a rotorcraft, and vice versa.
- (e) Installation data must be applicable and appropriate for the aircraft’s general construction (e.g. all-metal, glass-reinforced plastic or wood).

A13.3.5 ADS-B systems that acquire a GNSS position source from a unit or system that also supplies GNSS position source data to other systems (e.g. to flight management systems or navigation systems) may create new failure conditions and classifications that require analysis by a certificated Part 146 design organisation, and are **not** captured by this advisory circular.

A13.3.6 Existing antennas and altitude encoders may be used provided they are compatible with the ADS-B system and included in the equipment manufacturer's documentation.

A13.3.7 Any limitations defined by the equipment manufacturer apply.

A13.3.8 The installer should have the written permission of the STC holder to use the technical data.

A13.4 General

A13.4.1 A system ground test verifying all transmitted data according to Notice of Requirements NTC 91.258 has to be performed.

A13.4.2 Notice of Requirements NTC 91.258, requires that transponders meet the requirements of TSO-C166b (or equivalent). **This advisory circular only applies to transponders meeting FAA TSO-C166b.**

A13.4.3 Notice of Requirements NTC 91.258, requires that GNSS position sources meet the requirements of TSO-C145(), TSO-C146() or TSO-C196 (or equivalent). **Only GNSS position sources meeting FAA TSO-C145() are covered in this advisory circular.**

A13.4.4 Part 91, Appendix A.23, requires that each altitude encoder meets the requirements of TSO-C88().

A13.5 Technical instructions

A13.5.1 Ensure the aircraft is safe for servicing.

A13.5.2 Remove access panels etc. as required in accordance with the aircraft manufacturer's maintenance manual.

A13.5.3 If an existing transponder is to be removed.

- (a) Open the transponder circuit breaker or remove the transponder fuse, as required, to isolate power from the existing transponder.
- (b) Remove the existing transponder, mounting tray, antenna and wiring as required.

A13.5.4 Install the ADS-B system in accordance with the STC installation technical data.

A13.5.5 Install the transponder as follows.

- (a) If the transponder is being installed in a new location, determine a suitable location for the transponder. The transponder should be located in a position which is viewable and accessible to the pilot from his/her normally seated position. The preferred location is a standard manufacturer-installed avionics rack.
- (b) Install the transponder mounting tray at the location determined in paragraph A13.5.5(a). The installation is to be carried out in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B. The installation should also conform to the following requirements.
 - (1) Manufacturer-supplied or standard parts should be used.

- (2) The transponder mounting should be tested to ensure that the transponder and rack will be restrained throughout the flight envelope.
- (3) Where a modification is required to the aircraft structure to show compliance with paragraph A13.5.5(b)(2), the modification is to be carried out in accordance with the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.

A13.5.6 If required, install the transponder antenna as follows.

- (a) Determine an approved location for the transponder antenna in accordance with FAA AC43.13-2B or the aircraft manufacturer's instructions. The antenna should not be located within 0.9m of any other antenna.
- (b) Install the transponder antenna in the location determined in paragraph A13.5.6(a), in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B. The transponder antenna installation should be tested to ensure that it will be restrained throughout the flight envelope.

A13.5.7 If required, install the remote GNSS antenna as follows.

- (a) Determine an approved location for the GNSS antenna on the upper fuselage in accordance with FAA AC43.13-2B or the aircraft manufacturer's instructions. The antenna should not be located within 1.1m of any other antenna. Particular care should be taken to ensure that at least the minimum separation is maintained between the GNSS antenna and VHF communications and ELT antennas.
- (b) Install the manufacturer-approved GNSS antenna in the location determined in paragraph A13.5.7(a), in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B. The GNSS antenna installation should be tested to ensure that it will be restrained throughout the flight envelope.
- (c) If using an internally-mounted, manufacturer-supplied remote antenna, install the antenna in accordance with the manufacturer's installation instructions. Ensure that the antenna and associated cable will not interfere with the pilot's vision, aircraft controls or displays, or pilot/passenger egress.

A13.5.8 If installing an external GNSS position source dedicated to the ADS-B system, install the GNSS position source in accordance with the applicable requirements of Appendix 4.

A13.5.9 If an existing altitude encoder is to be removed.

- (a) Open the encoder circuit breaker or remove the encoder fuse, as required, to isolate power from the existing encoder.
- (b) Remove the existing encoder, mounting provisions, and static connections as required. Ensure any unused static lines are blanked and stowed in such a manner so as to prevent a new low point being introduced in the aircraft static system.

A13.5.10 Install the altitude encoder as follows.

- (a) If the encoder is being installed in a new location, determine a suitable location for the encoder. The encoder should be located in a position which is accessible to the aircraft static lines and will not introduce a new low point in the aircraft static system.
- (b) Install the encoder at the location determined in paragraph A13.4.10(a). The installation is to be carried out in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B. The installation should also conform to the following requirements.

- (1) Manufacturer-supplied or standard parts should be used.
 - (2) The encoder installation should be tested to ensure that the encoder will be restrained throughout the flight envelope.
 - (3) Where a modification is required to the aircraft structure to show compliance with paragraph A13.5.10(b)(2), the modification is to be carried out in accordance with the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.
- (c) The encoder is to be connected to the aircraft static system in accordance with the manufacturer's installation instructions using manufacturer-approved connections. No new low point is to be introduced in the aircraft static system.

A13.5.11 Install and placard a suitably rated circuit breaker or fuse.

A13.5.12 Interconnect the transponder, altitude encoder and antenna in accordance with the manufacturer's installation instructions. Wire listed in FAA AC43.13-1B, Chapter 11 or equivalent is to be utilised.

A13.5.13 Replace the access panels removed in paragraph A13.4.2 in accordance with the aircraft manufacturer's maintenance manual.

A13.5.14 Close the transponder and altitude encoder circuit breaker(s) or install the fuse(s).

A13.6 Post-installation testing

A13.6.1 Carry out a leak test of the aircraft static system in accordance with Part 43, Appendix D.1.

A13.6.2 Carry out a functional test of the transponder in accordance with Part 43, Appendix E, and the manufacturer's installation/operation instructions. A functional test of the transponder/altitude encoder system should be carried out in accordance with Part 43, Appendix D.3, Notice of Requirements NTC 91.258, and the manufacturer's installation/operation instructions. Checks are also to be carried out to determine satisfactory operation of all disturbed systems, that there is no interference between avionics systems, no effect on the aircraft compass system and that there is no interference with the aircraft flight controls.

A13.6.3 Verify compliance with both the system configuration and equipment performance requirements of Notice of Requirements NTC 91.258.

A13.7 Manuals

A13.7.1 Generate and issue instructions for continued airworthiness (refer paragraph 14.8).

A13.7.2 Insert the equipment operating instructions in the AFM/POH (refer paragraph 14.9).

A13.8 Certification of release to service

A13.8.1 Amend the aircraft's weight and balance records (refer AC43-2).

A13.8.2 Complete or update electrical load analysis (ELA), retain copy with aircraft and submit copy with documentation (refer AC21-11 & 91-23).

A13.8.3 Amend the aircraft's form CAA 2129, if necessary (refer AC43-10).

A13.8.4 Complete form CAA043-01 *Modification Record* and process in accordance with paragraph 14 of this advisory circular. Include the statement below along with make, model and serial number of the ramp test set used for the post installation testing must be included in form CAA043-01.

The installed ADS-B OUT system was shown to meet the equipment and performance requirements of CAA NZ Notice of Requirements NTC 91.258.

A13.8.5 Make a certified statement of release to service in accordance with rule 43.105 as well as detailing the work carried out and conformity with Appendix 13 to this advisory circular. Following system performance verification of the ADS-B OUT installation by ground testing, the results of the system performance must be filed in the aircraft maintenance record (evidence of system's performance may be in the form of automated test reports or test equipment screen shots if automated test reports are not available). When system performance is found acceptable, that installer will have to include the following statements in the aircraft maintenance records:

This ADS-B OUT system installation was completed using CAA NZ advisory circular AC43-14 Appendix 13.

and

The installed ADS-B OUT system was shown to meet the equipment and performance requirements of CAA NZ Notice of Requirements NTC 91.258.

A14. APPENDIX 14—Temporary Mounting of Lightweight Cameras

A14.1 Description

A14.1.1 This appendix describes acceptable technical data for internal or external installation of lightweight cameras on a temporary basis.

A14.1.2 The practice of mounting cameras to aircraft introduces a hazard of camera detachment that may cause aircraft damage, hazard to third parties on the ground, or hazard to the aircraft occupants in the event of an emergency landing, during manoeuvres, or by jamming controls.

A14.2 Applicability & limitations

A14.2.1 This appendix is limited to VFR operations, and it excludes operations for 'hire and reward'.

A14.2.2 Installation of each camera and mounting provision is limited to a combined weight of less than 300g; and frontal area of less than 30cm². Frontal area is the area of the camera and mount as projected from the front of the aircraft.

A14.2.3 The installation is temporary and time limited to two calendar days, unless it complies with paragraph 14.5.3.

A14.2.4 All limitations of paragraph 2.1 apply, with the exception that this appendix is limited to all unpressurised aircraft with maximum take-off mass of less than 2000kg and a passenger seating capacity equal to 2 or less.

A14.2.5 This advisory circular is applicable to installations which are installed on a 'no hazard, no interference' basis where:

- (a) Cameras have GSM transmitting functions disabled.
- (b) Cameras that have transmitting functions should be located in accordance with the guidelines of paragraph 9 in terms of spacing from antennas or avionics equipment.
- (c) Cameras must be self-contained with internal batteries and no external wiring.

A14.2.6 Not applicable to carry-on cameras held in hand by passengers which do not require approval, nor to devices worn by the pilot e.g. helmet mounted cameras.

A14.2.7 Paragraphs 1 to 14 of this advisory circular apply.

A14.3 Technical instructions

A14.3.1 Installation and release to service

- (a) Installation and release to service may be performed by an appropriately authorised person in accordance with Part 43.

A14.3.2 Installation

- (a) Ensure the aircraft is safe for servicing.
- (b) All reasonable steps must be taken to reduce the risk of in-flight detachment.
- (c) If the installation cannot comply with this advisory circular or if extensive testing or analysis is required, the modification documentation is to be submitted for approval, using a form CAA337 to a certificated Part 146 design organisation, or the CAA.

- (d) Determine a suitable location(s) for the camera(s) to be installed whether external or internal as follows in paragraphs 14.3.3 and 14.3.4 (respectively).

A14.3.3 External mounting

- (a) The maximum number of external cameras on each wing and empennage must be 1 each.
- (b) The installer must use their judgement to ensure that the equipment does not present a hazard to the aircraft by its:
 - (1) ability to withstand aerodynamic loads (i.e. robust construction, no loose components)
 - (2) flammability (camera must meet 'CE' or equivalent electrical equipment standard)
 - (3) detachment in flight (such that if it were to detach, it will not cause a hazard to critical parts of the aircraft such as propeller/rotors, engine, empennage, or flight control surfaces and systems)
 - (4) interference with the aerodynamic or flight control characteristics (i.e. not placed in areas which will reduce control authority or on slender structures; not on control surfaces; not on horizontal tail surface; not close to or directly in front of flying controls; not upstream or close to probes such as pitot-static)
 - (5) disruption of engine/propeller/rotor characteristics (mounting must not be in locations where flow into or out of ducts/cowlings/props may be interrupted)
 - (6) disruption of navigation/communication equipment (mounting must be at least 1m away from antennas).
- (c) When the installation is not performed by the pilot, the installer must mount a placard visible to the pilot with the words.

CAUTION: *Temporary camera installation may have effects on flight characteristics and performance. VNE 150 KIAS, VFR only.*

- (d) Care must be taken to avoid damage to the mounting surface by using an attachment that conforms to the surface contour. Do not mount on fabric surfaces.

A14.3.4 Internal mounting

- (a) The installer must use their judgement to ensure that the equipment does not present a hazard by:
 - (1) obstructing the flight controls and instruments, or pilot's visibility
 - (2) reducing structural capability of mounting provisions
 - (3) interfering with cockpit controls
 - (4) possibility of head-strike on the installed equipment for crew or passengers
 - (5) restricting exits or seats during emergency egress.
- (b) Mounting must be at least 1m away from antennas.

A14.3.5 Acceptable mounting techniques

- (a) The use of suction cups alone are not suitable as pilots have experienced in-flight detachment which may be considered a breach of rule 91.201 *Safety of aircraft*. The change in atmospheric pressure and variability of attachment and quality means that suction cups are not suitable.

- (b) Mounting plates which closely match the surface to which they are to be attached may be used and attached with reinforced pressure sensitive tape of a suitable aviation standard.
- (c) The use of proprietary self-adhesive mounts or suction cups can be used provided they are installed with a second, independent means of attachment such as a lanyard/strap or reinforced pressure sensitive tape of a suitable aviation standard.
- (d) Parts of the camera that could detach such as battery compartments must be taped over.
- (e) Rigid mounting extensions should not exceed 5cm in length.
- (f) The structural integrity of the aircraft must not be compromised by the installation.

A14.4 Post-installation testing

A14.4.1 The installation is to be carried out in accordance with any requirements of the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.

A14.4.2 The installation and any secondary means of attachment must be tested to ensure that it will be restrained throughout the flight envelope to the following loads using a "pull test" with a calibrated spring balance. The load must be maintained for at least 3 seconds without significant deflection or permanent deformation of any part of the mount or permanent loosening/shifting.

(a) **External mounting test loads (to be applied at the centre of the camera):**

- (1) 3kg forwards
- (2) 2kg rearwards
- (3) 3kg upwards
- (4) 3kg downwards
- (5) 1kg port
- (6) 1kg starboard.

(b) **Internal mounting test loads (to be applied at the centre of the camera):**

- (1) 4.5kg in the direction of any controls or passenger locations.

A14.4.3 For those cameras with other transmitting functions (e.g. bluetooth, wifi), carry out the post-installation EMI/EMC tests.

A14.5 Certification of release to service

A14.5.1 Record this advisory circular appendix as reference and the location, method of attachment, and details of pull test carried out in the aircraft maintenance records.

A14.5.2 Due to the lightweight, temporary nature of this modification, the following are not required.

- (a) Amendment of weight and balance
- (b) Amendment of form CAA 2129
- (c) Amendment of the AFM/POH
- (d) Completion of form CAA043-01 *Modification Record*

A14.5.3 The 2 day time limitation of the installation may be reset without re-installation by repetition of the mount integrity “pull test” and recording of this in the aircraft maintenance records.

A14.5.4 Make a certified statement of release to service in accordance with rule 43.105, detailing the work carried out and conformity with Appendix 14 to this advisory circular.

A14.5.5 If there are any accidents, incidents or defects as a result of the installation, report them using form CAA005D to CA005@caa.govt.nz