

Revision 4

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## Avionics, Installations— 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 obligations under the Civil Aviation Rules, the Civil Aviation Act 1990 and other legislation.

Advisory circulars reflect the Director's view on the rules and legislation. They express CAA policy on the relevant matter. They are 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 must not be regarded as an acceptable means of compliance.

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

### Purpose

This advisory circular provides—

- methods, techniques, and practices that are acceptable to the Director for showing compliance with Part 43-*General Maintenance Rules*
- technical instructions which are 'acceptable technical data' under Part 21, Appendix D(a)(6), for avionics installations.

### Related Rules

This advisory circular relates specifically to Civil Aviation Rules Part 43 and Part 21, Appendix D.

### Change Notice

Revision 4 provides clarity around the use of this advisory circular and the information requirements to be forwarded to CAA.

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## 1. Introduction

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.

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

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

This advisory circular provides acceptable technical data for avionics modifications.

The data is restricted to unpressurised aircraft of less than 5700kg MCTOW and less than 10 passenger seats, where the modification is not classified as a major modification.

## 3. General

This advisory circular is divided into two parts. The first part of the circular provides the elements that must be addressed for all modifications conducted under this advisory circular, noting that not all elements will be required in all cases. The second part of the circular consists of a series of appendices which provide modification technical instructions for various types of installations.

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

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. For avionics modifications these incidents are covered in the definition in this advisory circular.

Provided the modification is not classified as major, this advisory circular provides acceptable technical data for avionics modifications covering the installation of the following equipment

- replacement fit-form-function systems
- FAA TSO-C126 ELTs
- transponder/encoder (noting that this excludes Mode S and ADS-B)
- VFR GPS (noting that this excludes GPS units optimised for specialist applications such as agricultural aviation)
- audio and intercom
- VHF communication
- VHF radio navigation and DME
- voltage converters
- non-aeronautical avionics equipment

- 12VDC electrical distribution system for gliders
- situation awareness equipment for gliders

Also included in Appendix 11 is acceptable technical data covering the removal of avionics equipment.

## 4. Definitions

**Fit-form-function** in respect of avionics equipment, is equipment specified by a manufacturer to be a direct replacement for another item of equipment. The equipment must—

- utilise the same—
  - mounting provisions
  - wiring
  - connectors
- have an equivalent level of performance and certification.

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

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

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

- appreciable effect on weight
- appreciable effect on balance
- appreciable effect on structural strength
- appreciable degradation of reliability or performance
- interfaces and degree of integration with other systems
- appreciable effect on operational characteristics of the product
- change to the flight manual other than the addition of a supplement
- 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)
- mandated by an airworthiness directive or terminating action of an airworthiness directive
- the change is accomplished by methods other than acceptable methods, techniques and practices or elementary operations
- the change will be a significant change to primary structure or life limited parts

- the change will affect the product's TSO.

Examples of a major modification include the installation of—

- HF radio transmitter system
- GPS system required for IFR operations
- any avionics modification to an aircraft fitted with—
  - FADEC (Full Authority Digital Engine Control)
  - Fly by Wire systems.

**Non-aeronautical avionics equipment** in respect of equipment installed in accordance with this advisory circular is electrical and electronic equipment which is—

- not required by an airworthiness or rule requirement
- suitable for installation and use in aircraft
- 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 is 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 stand-alone installation includes all components associated with the function being installed. Example: for a VHF installation it could include the transceiver, controller, antenna, rack and wiring. A major modification or a modification involving a change to a component or appliance is not to be considered a stand-alone installation.

**Transverse separation** is the separation of the aircraft fuselage across the longitudinal axis.

## 5. Acceptable Technical Data

This advisory circular provides acceptable technical data at the appendices for various avionics installations that are not considered major modifications. The appendices should be used in conjunction with the equipment manufacturers' data including—

- installation manuals
- installation and checkout manuals
- operation and installation instructions
- installation drawings.

## 6. Equipment Selection

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

## 7. Equipment Installation

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

The installation of equipment under the provisions of this advisory circular must consider the overall human factors of the installation. Factors to be considered in the human factors evaluation are—

- indicators and controls are clearly visible to the crew
- the new equipment or modified installation will not impair crew visibility
- the crew can operate controls required in flight from their normally seated position
- misleading information must not be presented to the crew; the source of all data presented to the crew must be easily determined
- readability of displays and indicators under varying light conditions must be considered
- controls and switches must be clearly labelled and operate in instinctive directions.

## 8. Equipment Cooling

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, eg a radio stack, should be considered.

## 9. Antenna Location

Where possible, antennae should be located at the aircraft manufacturer-approved location or in accordance with FAA AC 43.13-2B chapter 3. Where an approved location cannot be determined for the antenna being installed, the following guidelines should be followed—

- antennae should not be located within 0.9m of each other
- due to the sensitivity of the receiver, GPS antennas should not be located within 1.1m of a transmitter antenna.

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 tests should include tests to ensure the satisfactory operation of the system being installed and a check for no-interference between other avionics systems.

## 10. Wiring and Wiring Practices

All electrical wiring and wiring practices should be conducted in accordance with SAE AS 50881F, FAA AC43.13-1B chapter 11, or an equivalent acceptable standard. Particular attention must be paid to bonding and earthing requirements.

## 11. Weight and Balance

The change in weight and balance is to be amended in accordance with AC43-2.

When discrete equipment is installed at a defined location, the weight and balance records should be revised to reflect the change. 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

An electrical load analysis is to be carried out to determine that the—

- electrical load is less than 85% of the maximum continuous operating rating of the power generating system
- derated battery capacity is sufficient to operate emergency systems for 30 minutes following a failure the aircraft's power generating system or as required for the aircraft's operations.

## 13. Post-installation Testing

The installation is to be tested in accordance with the checkout procedures in the manufacturers' manuals and the applicable requirements of Part 43. The tests should include, but are not limited to, confirmation that—

- the system operates correctly in accordance with the manufacturers' specifications
- there is no interference between systems (see below)
- the equipment is suitable for the intended purpose
- the installation meets the relevant structural requirements and will be restrained throughout the flight envelope.
- the system does not pose any HMI issues to the crew.

*Where the mount or its' failure could prove hazardous to any occupants, the mount and equipment should be tested to ensure they will be restrained when subject to an upward load of 5½ times the total equipment weight and a forward load of 9 times the total equipment weight.*

- There is no effect on the aircraft's magnetic compass system.
- The installation does not interfere with any controls. These checks should include but are not limited to—
  - a check of all flying controls for full and free movement
  - a check of engine control levers to ensure that there is no restriction throughout their range of movement.

### ***Check for non-interference***

Part of the post-installation checks should include a test to determine that there is no interference between avionics systems. Some factors to be considered when determining the extent of the no-interference check are the—

- type of system(s) being installed
- degree of complexity of the system interconnect
- physical location of equipment
- cable routing
- antenna locations
- consequence of any interference on the ability to safely operate the aircraft and systems.

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—

- all avionics systems should be turned ON and the ELT should be ARMED
- each of the following items of equipment should be operated in sequence and all other systems checked for any interference—
  - RF transmitters
  - equipment with a high voltage switched power source such as a strobe
  - equipment containing motors or generators
- GPS equipment should be specifically checked for interference when transmitting on each VHF for 20 seconds on each of the following frequencies—
  - 121.150 MHz
  - 121.175 MHz
  - 121.200 MHz
  - 131.250 MHz
  - 131.275 MHz
  - 131.300 MHz
- when looking for interference, the following should be considered—
  - is there any audible interference in the aircraft audio, intercom or communication systems?
  - is there any observable change in navigation information including—
    - heading pointers
    - to/from indications
    - deviation signals
    - validity flags
    - warning/message annunciations

- loss of navigation information
- is there any inadvertent operation or failure-to-operate of any system?
- a validation flight may be required to check some systems for interference effects e.g. an existing autopilot.

*Flight validation checks should only be carried out after ground tests have been completed satisfactorily.*

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 Aircraft Certification Unit.

## 14. Modification Documentation

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

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

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 certificate of release to service being issued. Forward to [avionics@caa.govt.nz](mailto:avionics@caa.govt.nz) or Avionics Team, Aircraft Certification Unit, Civil Aviation Authority, P.O.Box 3555, Wellington 6140.

Airworthiness directives 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.

### ***Certification***

The certification of release to service in respect of avionics modifications embodied using this advisory circular as acceptable technical data, must be issued by an appropriately qualified person. It is important to recognise that this advisory circular only provides for the acceptance of the technical data, 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.

Rule 43.51, in part, promulgates the appropriate qualification for a person to perform maintenance as being either—

- a current aircraft maintenance engineer licence and appropriate type rating issued under Part 66; or
- a current Australian aircraft maintenance engineer licence and appropriate rating issued by Civil Aviation Safety Authority of Australia and registered in New Zealand; or
- an authorisation issued by the holder of a Part 145 aircraft maintenance organisation certificate, to perform work within the scope of that certificate; or
- a maintenance approval issued under Part 66; or
- for gliders, in addition to the above, a person authorised by a Gliding organisation.

The privileges of a maintenance approval issued under Part 66 will be clearly indicated on the document. In the case of a Part 145 company authorisation, the company exposition will detail the privileges of each authorisation.

The privileges of an aircraft maintenance engineer licence issued under Part 66 are determined by the category in which the licence is issued and the ratings attached to the document. Category demarcations are listed in advisory circular AC66-1, Appendix 3. The following points are provided as clarification to this appendix.

- Category aeroplane and rotorcraft are the only categories that include the total aircraft structure.
- Category radio includes radio racks, shock mounts, bonding cables, looms, antennas, and their attachment to the aircraft structure. This includes installation to the structure when carried out in accordance with acceptable technical data and within the restrictions of this advisory circular.

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. 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.

### **Form CAA 2129 Action**

A new form CAA 2129 must be completed for all changes in the avionics equipment installation in accordance with advisory circular AC43-10. 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 AC43-14 and the appropriate appendix.

### **Integrated Systems**

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.

### **Instructions for Continued Airworthiness**

For all equipment installed, conduct a review and/or an assessment of the requirements for ongoing maintenance to ensure continued airworthiness. These requirements are to be generated as ICA's and added to the aircraft's maintenance schedule.

## **APPENDIX 1—Replacement ‘Fit-Form-Function’ Equipment**

### **1. Description**

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

### **2. Applicability**

2.1. All unpressurised aircraft less than 5700kg and 10 passenger seats where the modification is not classified as a major modification.

### **3. General**

3.1. Replacement fit-form-function equipment must—

3.1.1. perform an identical function to the equipment being replaced

3.1.2. not alter the existing approved aircraft maintenance requirements

3.1.3. be of an equivalent approval level as defined in Part 91, Appendix A.9

3.1.4. be specified by the equipment manufacturer as being a direct replacement for the equipment being removed.

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

3.2.1. equipment rack or mounting provisions

3.2.2. wiring.

3.3. The interface with existing systems must not be altered.

### **4. Technical instructions**

4.1. Ensure the aircraft is safe for servicing.

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

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

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.

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

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 subsection 4.4 of Appendix 1 to this advisory circular. The existing rack(s) or mounting provisions are to be utilised.

- 4.7. Replace the access panels removed in subsection 4.3 of Appendix 1 to this advisory circular in accordance with the aircraft manufacturer's maintenance manual.
- 4.8. Close the circuit breakers or reinstall the fuses removed in subsection 4.2 of Appendix 1 to this advisory circular.
- 4.9. Carry out a functional test of the installed system and all other disturbed systems in accordance with the applicable Part 43 appendix 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.
- 4.10. Amend the aircraft's weight and balance records in accordance with advisory circular AC43-2.
- 4.11. Complete an ELA or provide an analysis of the comparison between the new and old.
- 4.12. Amend the aircraft's form CAA 2129 in accordance with advisory AC43-10.
- 4.13. Generate and issue instructions for continued airworthiness.
- 4.14. Complete form CAA043-01 *Modification Record* and process in accordance with section 14 of this advisory circular.
- 4.15. Make a certified statement of release to service in accordance with rule 43.105, detailing the work carried out and compliance with Appendix 1 of this advisory circular.

## APPENDIX 2—Installation of FAA TSO-C126 ELTs

### 1. Description

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

### 2. Applicability

- 2.1. All unpressurised aircraft less than 5700kg and 10 passenger seats where the modification is not classified as a major modification.

### 3. General

- 3.1. Part 91, Appendix A.15 (a), requires that all ELTs installed after 22 November 2007 must meet the requirements of TSO-C126.
- 3.2. Emergency locator transmitters should be installed in accordance with the requirements of—
  - 3.2.1. the manufacturers' installation instructions
  - 3.2.2. Any airworthiness directives applicable to the aircraft type (e.g. DCA/HELI/3)
  - 3.2.3. Part 91, Appendix A.15
  - 3.2.4. advisory circular AC43-11.

### 4. Technical instructions

- 4.1. Register the new ELT with RCCNZ and advise them of the hex code for the beacon to be installed.
- 4.2. Verify that the new ELT to be installed has been registered. Proof of the registration is required for completion of the modification.
- 4.3. Ensure the aircraft is safe for servicing.
- 4.4. Remove access panels etc. as required in accordance with the aircraft manufacturer's maintenance manual.
- 4.5. If an existing ELT is to be removed—
  - 4.5.1. Open the ELT circuit breaker or remove the ELT fuse, as required, to isolate power from the existing ELT.
  - 4.5.2. Remove the existing ELT, remote switch/monitor (if installed), ELT mounting tray, antenna and wiring.
  - 4.5.3. 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.
- 4.6. Install the ELT as follows.
  - 4.6.1. Determine a suitable location for the ELT. The ELT should be located.
    - 4.6.1.1. Where the ELT can be mounted to primary structure.

- 4.6.1.2. Where the probability of damage in an accident or impact is minimised.
  - 4.6.1.3. For fixed and deployable automatic ELTs, as far aft as practicable.
  - 4.6.1.4. The distance between the ELT and the antenna is the least practicable.
  - 4.6.1.5. To prevent inadvertent operation of the crash activation sensor.
  - 4.6.1.6. With the axis orientated to sense a primary crash pulse in accordance with the manufacturer's instructions.
  - 4.6.1.7. 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.
- 4.6.2. Install the ELT mounting tray at the location determined in paragraph 4.6.1 of Appendix 2 to this advisory circular. 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.
- 4.6.2.1. 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 without the usual trusses, bulkheads, longerons, or floor beams composite structural techniques may be used to attach the equipment to the moulded structure provided the same structural requirements, are met.*
  - 4.6.2.2. Manufacturer-supplied or standard parts should be used.
  - 4.6.2.3. 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.
  - 4.6.2.4. Where a stiffening modification is required to the aircraft structure to show compliance with subparagraph 4.6.2.3 of Appendix 2 to this advisory circular, the modification is to be carried out in accordance with the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.
  - 4.6.2.5. The installed transmitter should be able to support a 100g 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.
- 4.6.3. Install a placard externally adjacent to the ELT installation which readily and clearly identifies the ELT location.
- 4.7. Install the ELT remote switch/monitor assembly as follows.
- 4.7.1. 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.
  - 4.7.2. Install the ELT remote switch/monitor assembly in the location determined in paragraph 4.5.1 of Appendix 2 to this advisory circular, in accordance with the

manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.

4.8. Install the ELT antenna as follows.

4.8.1. Determine a suitable location for the ELT antenna using the following criteria.

- 4.8.1.1. The ELT antenna should be located on the upper fuselage and not less than the manufacturer's recommended distance from other antennas. In any case, the ELT antenna is not to be located less than 0.6m (24 inches) from other VHF antennas.
- 4.8.1.2. The ELT antenna should be located so as to be vertically polarised.
- 4.8.1.3. The ELT antenna should be located as close as possible to the ELT transmitter. 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. If possible, do not install the antenna cable so that it passes through any bulkhead or similar structure.
- 4.8.1.4. If practicable, use structural features of the aircraft to prevent damage to the antenna (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 VSWR degradation.
- 4.8.1.5. 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.

4.8.2. Install the ELT antenna in the location determined in paragraph 4.6.1 in Appendix 2 to this advisory circular, in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC43.13-1B. The ELT antenna should be capable of supporting a 100g load in the plus and minus directions of the three principle axis of the aircraft.

4.9. If a high tensile cable is to be installed between the ELT and the antenna, use the relevant applicable methods and techniques specified in FAA AC43.13-2A to secure it to the aircraft. The cable should extend from the fuselage frame forward to the fuselage frame aft of where the ELT and antenna are located. Other considerations are as follows.

- 4.9.1. The tensile cable attachment fittings need to have a strength similar to that of the frames to which they are attached. Installation of the fittings must not reduce the strength of the structure to which they are attached.
- 4.9.2. The cable must have sufficient slack to not put a load on the aircraft fuselage through temperature variations or the normal distortion of the fuselage due to operating loads.

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

4.11. Interconnect the ELT transmitter, remote switch/monitor and antenna 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.

4.12. Ensure that the transmitter-antenna coaxial cable is fitted with vibration proof, RF connectors on each end with sufficient service loop at each end, to tolerate some aircraft

deformation in a crash without severing it. It is recommended that the antenna cable be covered with a fire resistant sleeve. When a tensile cable has been installed in accordance with subsection 4.9 of Appendix 2 to this advisory circular, route the antenna cable adjacent to the tensile cable; when securing the antenna cable, make sure that it is firm but can move so in a crash.

- 4.13. 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. Install the interface between the GNSS and the ELT in accordance with the manufacturer's instructions. If the wire loom is to be locally-manufactured, wire acceptable per FAA AC43.13-1B or equivalent is to be utilised. The wire routing and installation must meet the requirements of FAA AC43.13-1B, Chapter 11.
- 4.14. 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.
- 4.15. Replace the access panels removed in subsection 4.4 of Appendix 2 to this advisory circular in accordance with the aircraft manufacturer's maintenance manual.
- 4.16. Close the ELT circuit breaker or install the fuse.
- 4.17. Verify the ELT is transmitting the correct identification code. This will usually require the use of an ELT system tester.
- 4.18. The configuration data stored in the module must be verified as being correct for that particular aircraft. Verify the configuration module data is correct, and update the data as necessary, in accordance with the manufacturer's instructions. If the data is not correct, data in the ELT will be over-written by data from the configuration module when it is connected, resulting in an incorrectly configured ELT. 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. 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.

## 5. Certification

- 5.1. Review the RCCNZ beacon registration documentation and verify the ELT is correctly registered.
- 5.2. Amend the aircraft's weight and balance records in accordance with advisory circular AC43-2.
- 5.3. Amend the aircraft's form CAA 2129 in accordance with advisory circular AC43-10.
- 5.4. Complete an ELA or provide an analysis of the comparison between the new and old.
- 5.5. Generate and issue instructions for continued airworthiness.
- 5.6. Complete form CAA043-01 *Modification Record* and process in accordance with section 14 of this advisory circular.
- 5.7. Place the ELT manufacturer's operating instructions in the aircraft flight manual unless the relevant information is already given in a flight manual supplement.
- 5.8. Make a certified statement of release to service in accordance with rule 43.105, detailing the work carried out and conformity with Appendix 2 to this advisory circular.

## **APPENDIX 3—Installation of ATC Mode 3/A Transponder with Mode C Altitude Reporting**

### **1. Description**

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

### **2. Applicability**

- 2.1. All unpressurised aircraft less than 5700kg and 10 passenger seats where the modification is not classified as a major modification.

### **3. General**

- 3.1. Part 91, Appendix A.22 (1), requires that all Mode 3/A transponders meet the requirements of TSO-C74.
- 3.2. Part 91, Appendix A.23, requires that each altitude encoder meets the requirements of TSO-C88.
- 3.3. Appendix 3 to this advisory circular is divided into two parts—
  - 3.3.1. Part A – Installation of a transponder
  - 3.3.2. Part B – Installation of an altitude encoder

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

- 4.1. Ensure the aircraft is safe for servicing.
- 4.2. Remove access panels etc. as required in accordance with the aircraft manufacturer's maintenance manual.
- 4.3. If an existing transponder is to be removed—
  - 4.3.1. Open the transponder circuit breaker or remove the transponder fuse, as required, to isolate power from the existing transponder.
    - 4.3.1.1. Remove the existing transponder, mounting tray, antenna and wiring as required.
- 4.4. Install the transponder as follows.
  - 4.4.1. 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.
  - 4.4.2. Install the transponder mounting tray at the location determined in paragraph 4.4.1 of Appendix 3 to this advisory circular. 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.
    - 4.4.2.1. Manufacturer-supplied or standard parts should be used.

- 4.4.2.2. The transponder mounting should be tested to ensure that the transponder and rack will be restrained throughout the flight envelope.
  - 4.4.2.3. Where a modification is required to the aircraft structure to show compliance with subparagraph 4.4.2.2 of Appendix 3 to this advisory circular, the modification is to be carried out in accordance with the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.
  - 4.5. Install the transponder antenna as follows.
    - 4.5.1. 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.
    - 4.5.2. Install the transponder antenna in the location determined in paragraph 4.5.1 of Appendix 3 to this advisory circular, 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.
  - 4.6. Install and placard a suitably rated circuit breaker or fuse.
  - 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.
  - 4.8. Replace the access panels removed in subsection 4.2 of Appendix 3 to this advisory circular in accordance with the aircraft manufacturer's maintenance manual.
  - 4.9. Close the transponder circuit breaker or install the fuse.
  - 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.
  - 4.11. Amend the aircraft's weight and balance records in accordance with advisory circular AC43-2.
  - 4.12. Amend the aircraft's form CAA 2129 in accordance with advisory circular AC43-10.
  - 4.13. 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.
  - 4.14. Complete an ELA, retain copy with aircraft and submit copy with documentation.
  - 4.15. Complete form CAA043-01 *Modification Record* and process in accordance with section 14 of this advisory circular.
- 5. Technical instructions – Part B (Installation of a Mode C altitude encoder)**
- 5.1. Ensure the aircraft is safe for servicing.
  - 5.2. Remove access panels etc. as required in accordance with the aircraft manufacturer's maintenance manual.

- 5.3. If an existing altitude encoder is to be removed.
  - 5.3.1. Open the encoder circuit breaker or remove the encoder fuse, as required, to isolate power from the existing encoder.
  - 5.3.2. 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.
- 5.4. Install the altitude encoder as follows.
  - 5.4.1. 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.
  - 5.4.2. Install the encoder at the location determined in paragraph 5.4.1 of Appendix 3 to this advisory circular. 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.
    - 5.4.2.1. Manufacturer-supplied or standard parts should be used.
    - 5.4.2.2. The encoder installation should be tested to ensure that the encoder will be restrained throughout the flight envelope.
    - 5.4.2.3. Where a modification is required to the aircraft structure to show compliance with subparagraph 5.4.2.2 of Appendix 3 to this advisory circular, the modification is to be carried out in accordance with the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.
  - 5.4.3. 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.
- 5.5. Install and placard a suitably rated circuit breaker or fuse.
- 5.6. 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.
- 5.7. Replace the access panels removed in subsection 5.2 of Appendix 3 to this advisory circular in accordance with the aircraft manufacturer's maintenance manual.
- 5.8. Close the altitude encoder circuit breaker or install the fuse.
- 5.9. Carry out a leak test of the aircraft static system in accordance with Part 43, Appendix D.1.
- 5.10. 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.
- 5.11. Amend the aircraft's weight and balance records in accordance with advisory circular AC43-2.

- 5.12. Complete an ELA, retain copy with aircraft and submit copy with documentation.
- 5.13. Generate and issue instructions for continued airworthiness.
- 5.14. Amend the aircraft's form CAA 2129 in accordance with advisory circular AC43-10.
- 5.15. Complete Form CAA043-01 *Modification Record* and process in accordance with section 14 of this advisory circular.
- 5.16. 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.

## **APPENDIX 4—Installation of En-route GPS Equipment Approved 'for VFR Use Only'**

### **1. Description**

- 1.1. Installation of a stand-alone GPS system used for en-route, VFR navigation, noting that this specifically excludes GPS units optimised for specialist applications, such as agriculture operations.

### **2. Applicability**

- 2.1. All unpressurised aircraft less than 5700kg and 10 passenger seats where the modification is not classified as a major modification.

### **3. General**

- 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.
- 3.2. GPS systems installed for other than VFR purposes require approval, via either a form CAA337 or Supplemental Type Certificate, and are to be approved by either the CAA or a design organisation certificated under Part 146.

### **4. Technical Instructions**

- 4.1. Ensure the aircraft is safe for servicing.
- 4.2. Remove access panels etc. as required in accordance with the aircraft manufacturer's maintenance manual.
- 4.3. Install the GPS as follows.
  - 4.3.1. 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—
    - 4.3.1.1. restrict access to or view of any control, display or indicator; or
    - 4.3.1.2. restrict movement of the flight controls; or
    - 4.3.1.3. interfere with the pilot's vision along the flight path; or
    - 4.3.1.4. restrict pilot/passenger egress.
  - 4.3.2. Install the GPS at the location determined in paragraph 4.3.1 of Appendix 4 to this advisory circular. 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.
    - 4.3.2.1. Manufacturer-supplied or standard parts should be used.
    - 4.3.2.2. If a 'non-standard' method of installation is utilised, for example: velcro, the manufacturer's recommended procedures are to be followed.

- 4.3.2.3. The GPS mounting should be tested to ensure that it will be restrained throughout the flight envelope.
- 4.3.2.4. Where a modification is required to the aircraft structure to show compliance with subparagraph 4.3.2.3 of Appendix 4 to this advisory circular, the modification is to be carried out in accordance with the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.
- 4.4. If required, install a remote GPS antenna as follows.
- 4.4.1. 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.
- 4.4.2. Install the manufacturer-approved GPS antenna in the location determined in paragraph 4.4.1 of Appendix 4 to this advisory circular, in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC 43.13-1B. The GPS antenna installation should be tested to ensure that it will be restrained throughout the flight envelope.
- 4.4.3. 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.
- 4.5. If the GPS is to be connected to the aircraft power supply, install and placard an appropriately rated circuit breaker or fuse.
- 4.6. If required, install a remote GPS indicator as follows.
- 4.6.1. 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.
- 4.6.2. Install the indicator in the location determined in paragraph 4.6.1 of Appendix 4 to this advisory circular, in accordance with the manufacturer's installation instructions, the aircraft maintenance manual and the guidelines in FAA AC 43.13-1B.
- 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.
- 4.8. Replace the access panels removed in subsection 4.2 of Appendix 4 to this advisory circular in accordance with the aircraft manufacturer's maintenance manual.
- 4.9. Install the following placard in the vicinity of the GPS and in clear view of the pilot:
- GPS APPROVED FOR VFR USE  
ONLY
- 4.10. Close the GPS circuit breaker or install the fuse.
- 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.

- 4.12. Amend the aircraft's weight and balance records in accordance with advisory circular AC43-2.
- 4.13. Amend the aircraft's CAA 2129 in accordance with advisory circular AC43-10.
- 4.14. Complete an ELA, retain copy with aircraft and submit copy with documentation.
- 4.15. Generate and issue instructions for continued airworthiness.
- 4.16. Complete form CAA043-01 *Modification Record* and process in accordance with section 14 of this advisory circular.
- 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 4 to this advisory circular.

## APPENDIX 5—Installation of Audio Panel and Intercoms

### 1. Description

1.1. Installation of audio panel and intercom systems.

### 2. Applicability

2.1. All unpressurised aircraft less than 5700kg and 10 passenger seats where the modification is not classified as a major modification.

### 3. General

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

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).

3.2.1 For aircraft operating under IFR, the audio panel and intercom should be approved to Level 1. A Level 2 or 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.

3.2.2 For aircraft operating under VFR, the audio panel and intercom should be approved to Level 1 or 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 2 audio panel or the VHF. This could be accomplished by the provision of emergency jacks.

### 4. Technical instructions

4.1 Ensure the aircraft is safe for servicing.

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.

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

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—

4.4.1 accessibility and visibility of the equipment to the pilot

4.4.2 required operating environment for the equipment

4.4.3 required structural mounting provisions

4.4.4 no possibility of head-strike on the installed equipment for crew or passengers

4.4.5 no restriction during emergency egress.

4.5 Install the equipment in the location(s) determined in subsection 4.4 of Appendix 5 to this advisory circular. 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.
- 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.
  - 4.7 Replace the access panels removed in subsection 4.3 of Appendix 5 to this advisory circular in accordance with the aircraft manufacturer's maintenance manual.
  - 4.8 Close the audio panel/intercom circuit breaker or install the fuse.
  - 4.9 Close the circuit breakers and/or install the fuses opened/removed in subsection 4.2 of Appendix 5 to this advisory circular.
  - 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.
  - 4.11 Amend the aircraft's weight and balance records in accordance with advisory circular AC43-2.
  - 4.12 Amend the aircraft's form CAA 2129 in accordance with advisory circular AC43-10.
  - 4.13 Complete an ELA, retain copy with aircraft and submit copy with documentation.
  - 4.14 Generate and issue instructions for continued airworthiness.
  - 4.15 Complete form CAA043-01 *Modification Record* and process in accordance with section 14 of this advisory circular.
  - 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 5 to this advisory circular.

## APPENDIX 6—Installation of VHF Radio Communications

### 1. Description

1.1. Installation of an aeronautical VHF transceiver.

### 2. Applicability

2.1. All unpressurised aircraft less than 5700kg and 10 passenger seats where the modification is not classified as a major modification.

### 3. General

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).

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

### 4. Technical instructions

4.1. Ensure the aircraft is safe for servicing.

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

4.3. Install the VHF as follows.

4.3.1. 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—

4.3.1.1. restrict access to or view of any control, display or indicator; or

4.3.1.2. restrict movement of the flight controls; or

4.3.1.3. interfere with the pilot's vision along the flight path; or

4.3.1.4. restrict pilot/passenger egress.

4.3.2. Install the VHF at the location determined in paragraph 4.3.1 of Appendix 6 to this advisory circular. 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.

4.3.2.1. Manufacturer-supplied or standard parts should be used.

4.3.2.2. The VHF mounting should be tested to ensure that the VHF and rack will be restrained throughout the flight envelope.

4.3.2.3. Where a modification is required to the aircraft structure to show compliance with subparagraph 4.3.2.2 of Appendix 6 to this advisory circular, the modification is to be carried out in accordance with the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.

- 4.4. If required, install an antenna as follows.
  - 4.4.1. Determine a suitable location for the VHF antenna. Antennas should be installed in accordance with FAA AC 43-13.2B, 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.
  - 4.4.2. Install the manufacturer-approved VHF antenna in the location determined in paragraph 4.4.1 of Appendix 6 to this advisory circular, 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.
- 4.5. Install and placard an appropriately rated circuit breaker or fuse.
- 4.6. 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.
- 4.7. Replace the access panels removed in subsection 4.2 of Appendix 6 to this advisory circular in accordance with the aircraft manufacturer's maintenance manual.
- 4.8. Close the VHF circuit breaker or install the fuse.
- 4.9. Carry out an electrical load analysis to determine that the electrical load is within the maximum continuous operating rating of the power generating system. Retain a copy of the ELA with aircraft and submit copy with documentation.
- 4.10. 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.
- 4.11. Amend the aircraft's weight and balance records in accordance with advisory circular AC43-2.
- 4.12. Generate and issue instructions for continued airworthiness.
- 4.13. Complete form CAA043-01 *Modification Record* and process in accordance with section 14 of this advisory circular.
- 4.14. Amend the aircraft's form CAA 2129 in accordance with advisory circular AC43-10.
- 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.

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

### 1. Description

- 1.1. Installation of an aeronautical VHF navigation receiver, indicator and Distance Measuring Equipment (DME).

### 2. Applicability

- 2.1. All unpressurised aircraft less than 5700kg and 10 passenger seats where the modification is not classified as a major modification.

### 3. General

- 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).
- 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.

### 4. Technical instructions

- 4.1. Ensure the aircraft is safe for servicing.
- 4.2. Remove access panels etc. as required in accordance with the aircraft manufacturer's maintenance manual.
- 4.3. Install the navigation receiver or DME as follows.
  - 4.3.1. 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—
    - 4.3.1.1. restrict access to or view of any control, display or indicator; or
    - 4.3.1.2. restrict movement of the flight controls; or
    - 4.3.1.3. interfere with the pilot's vision along the flight path; or
    - 4.3.1.4. restrict pilot/passenger egress.
  - 4.3.2. Install the receiver, DME and indicator at the locations determined in paragraph 4.3.1 of Appendix 7 to this advisory circular. 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.
    - 4.3.2.1. Manufacturer-supplied or standard parts should be used.
    - 4.3.2.2. The equipment mounting should be tested to ensure that the receiver, indicator and associated rack(s) would be restrained throughout the flight envelope.

- 4.3.2.3. Where a modification is required to the aircraft structure to show compliance with subparagraph 4.3.2.2 of Appendix 7 to this advisory circular, the modification is to be carried out in accordance with the aircraft maintenance manual and the guidelines in FAA AC43.13-1B.
- 4.4. If required, install an antenna as follows.
- 4.4.1. 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.
- 4.4.2. Install the manufacturer-approved antenna in the location determined in paragraph 4.4.1 of Appendix 7 to this advisory circular 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.
- 4.5. Install and placard an appropriately rated circuit breaker or fuse.
- 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.
- 4.7. Replace the access panels removed in subsection 4.2 of Appendix 7 to this advisory circular in accordance with the aircraft manufacturer's maintenance manual.
- 4.8. Close the receiver circuit breaker or install the fuse.
- 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.
- 4.10. Amend the aircraft's weight and balance records in accordance with advisory circular AC43-2.
- 4.11. Complete an ELA, retain copy with aircraft and submit copy with documentation.
- 4.12. Generate and issue instructions for continued airworthiness.
- 4.13. Complete form CAA043-01 *Modification Record* and process in accordance with section 14 of this advisory circular.
- 4.14. Amend the aircraft's form CAA 2129 in accordance with advisory circular AC43-10.
- 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 7 to this advisory circular.

## APPENDIX 8—Installation of Voltage Converters

### 1. Description

1.1. Installation of voltage converters.

### 2. Applicability

2.1. All unpressurised aircraft less than 5700kg and 10 passenger seats where the modification is not classified as a major modification.

### 3. General

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

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 design organisation certificated under Part 146.

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

3.3.1. The equipment is to be suitable for use in aircraft. Examples of items to be considered are—

3.3.1.1. the operating environment

3.3.1.2. structural integrity of the equipment throughout the flight envelope

3.3.1.3. flammability requirements.

3.3.2. 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.

3.3.3. The equipment must not present a hazard either by its—

3.3.3.1. construction; or

3.3.3.2. installation; or

3.3.3.3. interface; or

3.3.3.4. operation.

3.3.4. 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, for example: the applicable FAA TSO approved.

### 4. Technical instructions

4.1. Ensure the aircraft is safe for servicing.

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

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

- 4.3.1. required operating environment for the equipment;
  - 4.3.2. any cooling requirements for the voltage converter; and
  - 4.3.3. required structural mounting provisions.
- 4.4. Install the equipment in the location determined in subsection 4.3 of Appendix 8 to this advisory circular. 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.
  - 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.
  - 4.6. Replace any access panels removed in subsection 4.2 of Appendix 8 to this advisory circular.
  - 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.
  - 4.8. Amend the aircraft's weight and balance records in accordance with advisory circular AC43-2.
  - 4.9. Complete an ELA, retain copy with aircraft and submit copy with documentation.
  - 4.10. Generate and issue instructions for continued airworthiness.
  - 4.11. Complete form CAA043-01 *Modification Record* and process in accordance with section 14 of this advisory circular.
  - 4.12. Amend the aircraft's form CAA 2129 in accordance with advisory circular AC43-10.
  - 4.13. 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.

## APPENDIX 9—Installation of ‘Non-Aeronautical’ Avionics Equipment

### 1. Description

1.1. Installation of ‘non-aeronautical’ avionics equipment.

### 2. Applicability

2.1. All unpressurised aircraft less than 5700kg and 10 passenger seats where the modification is not classified as a major modification.

### 3. General

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

3.1.1. cellular telephones

3.1.2. audio entertainment systems

3.1.3. FM transceivers.

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 design organisation certificated under Part 146.

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

3.3.1. The equipment is to be suitable for use in aircraft. Examples of aspects to be considered when determining this are—

3.3.1.1. the operating environment

3.3.1.2. structural integrity of the equipment throughout the flight envelope

3.3.1.3. ability of the antenna installation to withstand aerodynamic loads

3.3.1.4. flammability requirements.

3.3.2. 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.

3.3.3. The equipment must not present a hazard either by its—

3.3.3.1. construction; or

3.3.3.2. installation; or

3.3.3.3. interface; or

3.3.3.4. operation.

- 3.3.4. Installed cellular telephones are to be—
  - 3.3.4.1. approved for connection to any NZ cellular network only
  - 3.3.4.2. disabled during approach and take-off when operating under IFR.
- 3.3.5. The installed equipment should be compatible. For example—
  - 3.3.5.1. an antenna being utilised must be suitable for the intended purpose and matched to the transceiver with which it is being used
  - 3.3.5.2. if installing a radio it must be compatible with the aircraft audio system.

#### 4. Technical instructions

- 4.1. Ensure the aircraft is safe for servicing.
- 4.2. Remove access panels etc. as required in accordance with the aircraft manufacturer's maintenance manual.
- 4.3. Determine a suitable location(s) for all equipment to be installed. Consideration should be given to—
  - 4.3.1. accessibility and visibility of the equipment to the pilot
  - 4.3.2. required operating environment for the equipment
  - 4.3.3. required structural mounting provisions
  - 4.3.4. no possibility of head-strike on the installed equipment for crew or passengers
  - 4.3.5. no restriction during emergency egress.
- 4.4. Install the equipment in the location(s) determined in subsection 4.3 of Appendix 9 to this advisory circular. 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.
- 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.
- 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—
  - 4.6.1. the antenna is not to be installed within 0.9m of another antenna
  - 4.6.2. post-installation ground and flight tests are to be carried out to confirm the suitability of the antenna location.
- 4.7. Replace any access panels removed in subsection 4.2 of Appendix 9 to this advisory circular.
- 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.

- 4.9. Amend the aircraft's weight and balance records in accordance with advisory circular AC43-2.
- 4.10. Complete an ELA, retain copy with aircraft and submit copy with documentation.
- 4.11. Generate and issue instructions for continued airworthiness.
- 4.12. Complete form CAA043-01 *Modification Record* and process in accordance with section 14 of this advisory circular.
- 4.13. Amend the aircraft's form CAA 2129 in accordance with advisory circular AC43-10.
- 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 9 to this advisory circular.

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

### 1. Description

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

### 2. Applicability

- 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.

### 3. General

- 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.

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

- 3.2.1. the glider manufacturer; or

- 3.2.2. the CAA; or

- 3.2.3. a design organisation certificated under Part 146.

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

- 3.3.1. **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.

- 3.3.2. **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.

- 3.3.3. **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.

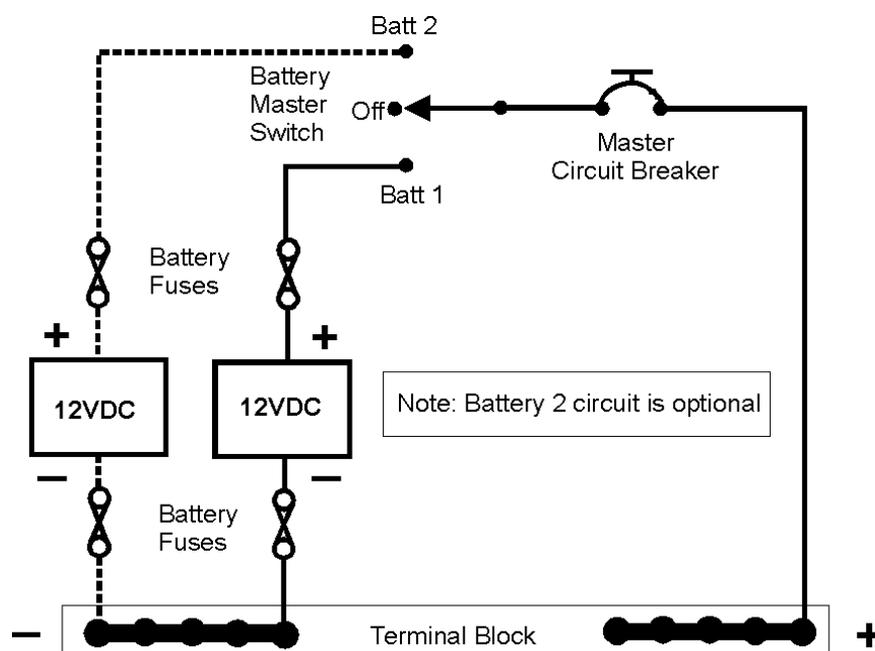
- 3.3.4. **A terminal block** to terminate the supply and allow multiple distribution to the equipment requiring power. The terminal block should be suitable for use in aeronautical applications.

- 3.3.5. **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.

#### 4. Technical instructions

- 4.1. Ensure the glider is safe for servicing.
- 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.
- 4.3. Determine suitable locations for the master switch, circuit breaker and terminal block—
  - 4.3.1. The master switch is to be located in the instrument panel in a position which is readily accessible and viewable to the pilot.
  - 4.3.2. 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.
  - 4.3.3. 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.
- 4.4. Install the master switch, circuit breaker and terminal block in the positions determined in subsection 4.3 of Appendix 10 to this advisory circular in accordance with the relevant manufacturers' instructions and the guidelines in FAA AC43.13-1B.
- 4.5. Route and connect wiring in accordance with Figure 1.
  - 4.5.1. Wire listed in FAA AC43.13-1B Chapter 11 as specified in paragraph 3.3.5 of Appendix 10 to this advisory circular is to be utilised.
  - 4.5.2. 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.
  - 4.5.3. The master circuit breaker and battery fuses should be rated as determined in paragraphs 3.3.2 and 3.3.3 of Appendix 10 to this advisory circular.
  - 4.5.4. Cable routing is to be in accordance with FAA AC43.13-1B, Chapter 11.

Figure 1



- 4.6. Placard the master switch, master circuit breaker, battery fuses and terminal block.
- 4.7. Replace any access panels removed in subsection 4.2 of Appendix 10 to this advisory circular.
- 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.
- 4.9. 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.
- 4.10. 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.
- 4.11. Complete an ELA, retain copy with aircraft and submit copy with documentation.
- 4.12. Generate and issue Instructions for Continued Airworthiness.
- 4.13. Complete form CAA043-01 Modification Record and process in accordance with paragraph 14 of this Advisory Circular.

## APPENDIX 11—Removal of Avionics Systems

### 1. Description

1.1. Removal of avionics systems.

### 2. Applicability

2.1. All unpressurised aircraft less than 5700kg and 10 passenger seats where the modification is not classified as a major modification.

### 3. General

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

### 4. Technical instructions

4.1. Ensure the aircraft is safe for servicing.

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

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

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

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

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

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.

4.8. Replace any access panels removed in subsection 4.2 of Appendix 11 to this advisory circular.

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 effect on the aircraft compass system and no interference with the aircraft flight controls.

4.10. Amend the aircraft's weight and balance records in accordance with advisory circular AC43-2.

4.11. Complete an ELA, retain copy with aircraft and submit copy with documentation.

4.12. Generate and issue instructions for continued airworthiness.

4.13. Complete form CAA043-01 *Modification Record* and process in accordance with section 14 of this advisory circular.

4.14. Amend the aircraft's form CAA 2129 in accordance with advisory circular AC43-10.

4.15. 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.

## APPENDIX 12—Installation of Situation Awareness Equipment for Gliders

### 1. Description

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

### 2. Applicability

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

### 3. General

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.

3.2. The FLARM equipment should be installed in accordance with—

3.2.1. The equipment manufacturer's installation manual

3.2.2. FAA AC43-13-1B standard practices.

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.

### 4. Technical instructions

4.1. Ensure the glider is safe for servicing.

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

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

4.3.1. to accessibility and visibility of the equipment to the pilot

4.3.2. to required operating environment for the equipment

4.3.3. to required structural mounting provisions

4.3.4. that no possibility of head-strike exists on the installed equipment for crew or passengers

4.3.5. no restriction during emergency egress

4.3.6. does not obscure any other essential instrument displays.

4.4. Install the equipment in the location(s) determined in subsection 4.3 of Appendix 12 to this advisory circular. 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.

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.

- 4.6. Replace any access panels removed in subsection 4.2 of Appendix 12 to this advisory circular.
- 4.7. Test the system in accordance with the manufacturer's instructions. Verify that—
  - 4.7.1. the software loaded into the system is the current version;
  - 4.7.2. the FLARM does not cause interference to other installed equipment; and
  - 4.7.3. equipment installed in the glider do not cause interference with the situation awareness equipment.
- 4.8. Amend the aircraft's weight and balance records in accordance with advisory circular AC43-2, if necessary.
- 4.9. Complete an ELA, retain copy with aircraft and submit copy with documentation.
- 4.10. Complete form CAA043-01 *Modification Record* and process in accordance with section 14 of this advisory circular.
- 4.11. Generate and issue instructions for continued airworthiness.
- 4.12. Amend the aircraft's form CAA 2129 in accordance with advisory circular AC43-10.
- 4.13. 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.