

# Advisory Circular

## AC43-11

Revision **3**

### **Aircraft Emergency Locator Systems**

**Xx yy 2018**

#### **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 acceptable to the Director for showing compliance with Part 43 and Part 91.

#### **Related Rules**

This advisory circular relates specifically to Civil Aviation Rule Parts 43 *General Maintenance Rules* and Part 91 *General Operating and Flight Rules*, Subpart G

#### **Change Notice**

Revision **3** updates the emergency locator transmitter (ELT) testing requirements.

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## Definitions and Abbreviations

See also Part 1 of the Civil Aviation Rules for other terms.

**Aircraft Emergency Location System (AELS)** means the complete installed system for the location of an aircraft that has been involved in an emergency, resulting in a crash situation.

**Air Traffic Control [ATC]** means the organisation responsible for providing air traffic control services.

**Emergency Locator Transmitter [ELT]** means an equipment that broadcasts a distinctive signal on a designated radio frequency to facilitate a search and rescue operation.

**Emergency Locator Transmitter (Automatic Fixed) [ELT (AF)]** means an emergency locator transmitter that is automatically activated and permanently attached to an aircraft.

**Emergency Locator Transmitter (Survival) [ELT (S)]** means an emergency locator transmitter that is stowed in an aircraft in a manner which facilitates its ready use in an emergency, is removable from an aircraft, and is manually activated.

**Emergency Position Indicating Radio Beacon [EPIRB]** means an equipment that broadcasts a distinctive signal on a designated radio frequency to facilitate a search and rescue operation, is designed to float upright, and is manually activated.

**Personal Locator Beacon [PLB]** means an equipment that broadcasts a distinctive signal on a designated radio frequency to facilitate a search and rescue operation, is designed to be carried on a person, and is manually activated.

**RCCNZ** means Rescue Co-ordination Centre New Zealand.

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

**TSO** means a Technical Standard Order issued by the Federal Aviation Administration of the United States of America.

## General

The operational Parts of the Civil Aviation Rules include a Subpart on equipment and instrument requirements.

Parts 91, 121, 133, 135, and 137 include Subpart F that specifies the equipment requirements for aircraft operating in New Zealand under the appropriate operating Part.

Each Subpart F is augmented by Part 91 Appendix A that provides standards and specifications equipment must meet to be considered acceptable.

Under rule 91.529, a person must not operate a New Zealand registered aircraft within the New Zealand Flight Information Region unless it is equipped with an acceptable and fully operable AELS installed in the aircraft.

Furthermore, a person must not operate an aircraft with a New Zealand certificate of registration that is equipped with an ELT\_(AF) or carries an ELT\_(S), EPIRB, or PLB that operates on 406 MHz unless it is coded in accordance with rule 91.529(f).

This advisory circular provides guidance for and summarises the requirements of performance, installation, and maintenance for AELS equipment.

## Design and Installation Considerations

For the maximum benefits of an AELS installation to accrue, the design and installation should be such that the system remains operable after an accident, as far as is reasonably practicable. The following conditions should be considered in the design and installation of the AELS.

*Note: The below are considerations only meant for guidance in developing a design and for installation for subsequent approval of technical data. This Advisory Circular does not constitute Acceptable Technical Data and may not be referenced as such.*

- 1) If a component of the AELS is required to be mounted to the aircraft, this should be to a primary load-carrying structure without reducing that structures capabilities. When a force of 450 newtons is applied to that component in the most flexible direction, it must not cause a static deflection of greater than 2.5 mm relative to a section of adjacent structure located between 0.3 m and 1.0 m from the attachment site.
- 2) Attachment of AELS components to thin partitions or to panels, such as the sides of baggage compartments, solely by means of Velcro strips and other flexible materials is not acceptable.
- 3) The AELS component can support a 100 G load in the plus and minus direction of the 3 principal axes of the aircraft.
- 4) The AELS components are preferably mounted as far aft as possible.
- 5) Any crash activation sensor should be designed and mounted so as to preclude inadvertent operation.
- 6) Any crash activation sensor should be oriented to sense a primary crash pulse along the longitudinal axis of the aircraft.
- 7) If the AELS includes an external antenna, it should be mounted to provide vertical polarisation with the aircraft in normal flight.
- 8) Any required cabling between the antenna and the AELS component(s) to be made as short as practicable.
- 9) Any external AELS antenna should not be mounted closer than 0.6 m from the nearest VHF antenna.
- 10) Any internal AELS antenna should be insulated from metallic structure and exposed to a window of not less than 0.3 m square.
- 11) Components of the system should be fitted with vibration proof RF connectors as required for the operation of the AELS.
- 12) Have the location(s) of the AELS identified as close as practicable to the point of access.
- 13) Any manual activation switch should be mounted within easy reach of the pilot.

### Aeroplanes

When an aeroplane is upright an antenna located externally on top of the rear fuselage provides better overall efficiency than an internal cockpit area antenna.

When an aeroplane is inverted:

- 1) An internal antenna exhibits the best overall efficiency in a high-wing aeroplane.
- 2) Neither antenna location has a significant advantage in a low-wing aeroplane.

Approximately one third of light aeroplanes come to rest inverted in a crash.

Select a location where the antenna can be installed close to the transmitter and preferably, where the aircraft structure can provide some protection to the system components in a crash.

## Helicopters

In helicopter installations care needs to be taken to site the antenna so as to minimise vibratory response which could lead to premature fatigue failure.

Cases have been documented where AELS whip antenna installed on certain helicopters have fractured in only a few hours' time in service.

In at least one case, the antenna subsequently came in contact with the tail rotor.

Locate the antenna as close as practicable to the transmitter and consider likely crash events when selecting the location.

Avoid installing the antenna on the side of the helicopter that is likely to be on the bottom in a dynamic roll-over.

## Antenna cable protection

As approximately one fifth of light aircraft accidents result in fire, the coaxial cable between the AELS and its external antenna should be sleeved with fire resistant materials.

The antenna cable should be installed with sufficient free cable, so that the cable will not be damaged during any distortion of the airframe in normal flight situations.

The antenna cable should not pass over a fuselage production joint.

If possible, do not run the antenna cable through any bulkhead or other similar structure.

## Emergency Locator Transmitter Registration

406 MHz ELTs, EPIRBs or PLBs fitted to or carried in New Zealand registered aircraft must have a New Zealand country code (whether operating in New Zealand or overseas) and be registered with the RCCNZ, otherwise a substantial penalty may be incurred.

Information on the registration of 406 MHz ELTs is on the web site <http://www.beacons.org.nz/>.

ELTs, EPIRBs or PLBs should be registered with RCCNZ prior to their being installed or carried in an aircraft.

As part of the installation certification, the beacon registration should be sighted by the certifying engineer.

Any changes to registration details such as emergency contact numbers or name of the aircraft operator must be notified to RCCNZ.

## Maintenance Requirements

### Scheduled maintenance

The AELS should be maintained in accordance with the manufactures instruction for continued airworthiness, as well as any requirements called out in rule 91.605.

The inspection of the aircraft prior to the issue of a release to service should include the following inspections.

- 1) AELS, antenna, antenna cable and remote switch installation for condition, security and being free of corrosion.
- 2) Placards for legibility.
- 3) System self-test carried out in accordance with the manufacturer's instructions.

For the purposes of this provision, routine maintenance is not considered to place the AELS unserviceable.

Rule 91.605 also requires an inspection for battery condition and expiry date.

The battery expiration date must be recorded in the aircraft maintenance logbook.

If the remote control/indicator has a battery fitted, the expiration date of this battery must also be recorded in the aircraft maintenance logbook.

Batteries are required to be changed:

- (a) on or before the expiry date; or
- (b) when the transmitter has been in use for more than one cumulative hour.

If a battery is replaced, the date stamped on the replacement battery must serve as the new expiration date and be recorded in the aircraft maintenance logbook.

At two-yearly intervals, the AELS must be tested for serviceability in accordance with the manufacturer's instructions.

### **AELS testing**

Any functional test of an AELS system should be carried out in accordance with the manufacturer's instructions. This does not necessarily require an on-air (RF transmission) test.

If an on-air test is required as part of the manufacturer's instructions, then this should be conducted only within the first five minutes after any hour and then only for a maximum of three audio sweeps of the transmitter. A VHF receiver tuned to 121.5 MHz should be used to monitor the tests.

Note: the reason for limiting the on-air test to a maximum of three audio sweeps of the transmitter is to prevent the transmission of a 406 MHz data message, which typically occurs 50 seconds after the ELT being activated.

### **Temporary removal of an AELS**

Rule 91.529(c) provides an ability for an aircraft to be operated under Part 91 with an inoperative AELS or without an AELS fitted.

This operation is permitted to allow the aircraft to be ferried to a place where repairs to, or installation of, a system can be carried out.

The flight is deemed to be a ferry flight and no passengers may be carried.

In the case of a ferry flight under the above provisions the system, or a suitable cockpit location, is required to be placarded 'Inoperative' and the appropriate maintenance entries made in the aircraft maintenance logbook in accordance with Part 43.