

### Emergency Locator Transmitters

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#### General

Civil Aviation Authority Advisory Circulars contain information about standards, practices, and procedures that the Director has found to be an **Acceptable Means of Compliance (AMC)** with the associated rule.

An AMC is not intended to be the only means of compliance with a rule, and 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.

An Advisory Circular may also include **guidance material (GM)** to facilitate compliance with the rule requirements. Guidance material must not be regarded as an acceptable means of compliance.

#### 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 Part 43 *General Maintenance Rules* and Part 91 *General Operating and Flight Rules*, Subpart G.

#### Change Notice

Revision 2 amends the RCCNZ contact telephone number.

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## Emergency Locator Transmitters

### Definitions and Abbreviations

In this advisory circular the following definitions and abbreviations apply:

**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 Appendix A that provides standards and specifications equipment must meet to be considered acceptable.

Under rule 91.529, a person must not operate an aircraft unless it is equipped with an acceptable and fully operable automatic emergency locator transmitter. Rule 91.529 provides exclusions for the following aircraft:

1. An aircraft with no more than one seat if the pilot is equipped with an Emergency Locator Transmitter (Survival) [ELT(S)] or Personal Locator Beacon (PLB).
2. A glider or microlight aircraft if at least one person carried in the glider or microlight aircraft is equipped with an ELT(S) or PLB.
3. A glider or powered aircraft, including a microlight aircraft, that is equipped with no more than two seats, if the glider or powered aircraft is operated not more than 10 nm from the aerodrome from which the glider or powered aircraft took off.
4. A manned free balloon.

Under rule 91.529, 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 CAR 91.529(f):

This advisory circular provides guidance for and summarises the requirements of performance, installation, and maintenance for Emergency Locator Transmitters.

## Performance Requirements

The ELT equipment required by rule 91.529 has a minimum performance standard defined in Part 91 Appendix A as TSO C126.

For the purposes of this provision, routine maintenance is not considered to place the ELT unserviceable. Routine maintenance is required by rule 91.615 and includes:

1. Battery replacement
2. Tests and inspections in accordance with Part 43.

## Emergency Operation

If an emergency develops in flight, activate the ELT; this will provide the RCCNZ with an early notification of distress and location. By activating the ELT RCCNZ can monitor the active beacon and will be able commence search planning ahead of an accident. If, in a subsequent crash, the ELT system becomes inoperative, the crash location will still be known reasonably accurately, and so enhance the search and rescue operation.

After a crash, do not turn the ELT off; the emergency services will do this when they arrive. Also, do not remove the ELT from the aircraft unless it is fitted with an antenna.

If the emergency situation is recovered, turn the ELT off and advise ATC or RCCNZ as soon as possible. If the ELT is turned off and ATC or RCCNZ are not advised as soon as possible, it will be assumed that the aircraft has crashed and search planning will have commenced.

After any activation of any emergency beacon (ELT or PLB) either for a **REAL Emergency** or an **INADVERTANT** activation contact ATC or RCCNZ on: 0508 4RCCNZ (0508 472 269) as soon as possible.

## Emergency Locator Transmitter Installations: Design Considerations

An ELT is an item of emergency equipment installed or carried on an aircraft to:

1. Facilitate the rescue of persons as quickly as possible;
2. Facilitate the recovery of human remains as quickly as possible;
3. Reduce the risk to search and rescue personnel;
4. Reduce the time and cost of search and rescue operations;
5. Preserve evidence for subsequent investigation.

For the maximum benefits of an ELT installation to accrue, the installation needs to be designed to minimise the risk of the system being rendered inoperative by reasonably foreseeable events in a crash sequence. Points to be considered in the design of the installation are:

1. Install the transmitter on primary structure with the g switch sensitive axis aligned with the appropriate aircraft axis.
2. Locate the ELT in the aft fuselage area.

3. Where possible, design the ELT mounting structure so that it is unlikely that a transverse separation will occur between the transmitter and the antenna. If the structure between the transmitter and the antenna cannot be made strong enough using conventional structural methods, fit a high tensile cable between the regions and route the antenna cable adjacent to the cable.
4. Locate the antenna as close as practicable to the transmitter to minimise a transverse separation occurring between the antenna and the transmitter (between the same fuselage frames is preferred) and in a location that minimises the risk of it suffering substantial damage in a crash. Use structural features of the aircraft to provide protection where possible. For helicopters, avoid locations that are likely to be damaged by the rotors or by the transmission system being displaced in a crash.
5. If the aircraft is fitted with an ELT that can accept an external position input and has an area navigation system (FMS or GNSS) with a compatible output, it is strongly recommended that the position output of the navigation system be connected to the ELT. Output of a GPS position in the ELT message improves the location accuracy from 3 km to 100 m and reduces the search area from 28 km<sup>2</sup> to 0.031 km<sup>2</sup>.
6. Covering the antenna cable with a fire resistant sleeving will increase the systems survivability.
7. Route the antenna cable to minimise the risk that dislocation of the aircraft structure will damage the cable. Fasten the cable so that it is restrained but can move in the event of a crash but not so loosely that it will either chaff or foul other cables or structure. The antenna cable must not cross a fuselage production joint.

### **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.

### **System Installation: General Requirements**

Part 43 requires that aircraft remain in their original or properly modified condition. The installation of an ELT constitutes a modification and a Form CAA 337 must be completed listing the acceptable technical data. The minimum standards for the installation of an ELT are detailed Part 91 Appendix A, paragraph A.15; this advisory circular provides other general requirements for the installation. Any 406 MHz ELT installation must be installed under the provisions for AC43-14 Appendix 2 or other approved modification.

The acceptable standards should produce reliable and effective ELT systems and keep unwanted activations to a minimum. The standards are based on the following sources:

1. RTCA DO-204 Minimum Operational Specification 406 MHz Emergency Locator Transmitters (ELT)
2. Comments from industry.

Not all of the recommendations from the above sources were suitable for incorporation in this AC. The following notes are a useful supplement to the requirements of Appendix A for planning an ELT installation:

### ***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. Either install additional structure or a high tensile cable to minimise the probability of a transverse separation severing the antenna cable. Location of the antenna and its proximity of other aerials must also be considered.

### ***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 ELT 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. Location of the antenna and its proximity of other aerials must also be considered.

### ***ELT Mounting***

The ELT mount must provide a load path from aircraft primary structural elements directly to the automatic activation system. The attachment should also be designed to minimise vibration. Excessive vibration may prevent satisfactory crash impact detection or may generate false crash signals. Alignment of the ELT sensitive activation axis must be in accordance with the manufacturer's instructions.

Attachments 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.

### ***Antenna Cable Protection***

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

The antenna cable should be installed with sufficient free cable to not allow distortion of the airframe to cause the cable to be severed. The antenna cable must not pass over a fuselage production joint. Where possible, install the transmitter and antenna between the same frames with additional structure to minimise the transverse separation risk. If possible, do not run the antenna cable through any bulkhead or other similar structure.

### ***Antenna Installation***

The presence of an ELT antenna in close proximity to a second antenna can cause some detuning and distortion of the radiation pattern of the second antenna and possibly interference by re-radiation of other signals.

There have been reports of VHF radio transmissions interfering with GPS equipment. The problem has been attributed to the VHF signal being received by the ELT antenna and the signal then exciting the output stage of the ELT. The ELT then radiated a weak harmonic signal that caused interference with the GPS. Ensure adequate separation from other antennae.

### ***Components***

The interaction of components in the ELT is often critical in arriving at acceptable overall performance. Component parts from other sources such as batteries, coaxial cables, and antennae should not be substituted for the original manufacturer's parts.

### ***Batteries***

The ELT battery (and remote control/indicator battery if applicable) expiration date must be recorded in the Aircraft Maintenance Logbook in accordance with rule 91.617(a).

### **Testing: Maintenance and Post Installation**

Tests 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.

The 406 MHz data message will be transmitted after 50 seconds of the ELT being activated.

The ELT system should be tested in accordance with the manufacturer's instructions for a new installation. This testing is to include verifying the ELT code and will usually require the use of an ELT system tester. The ELT remote control should be switched through each mode of operation according to the manufacturer's instructions to determine that the equipment is operating correctly.

Some ELT installations are fitted with a Configuration Module that automatically loads configuration data (coding, etc) into the ELT when it is installed. It is important that the Configuration Module data is correct for the particular aircraft, otherwise the ELT will be incorrectly coded. When an ELT is installed or updated, verify and / or update the Configuration Module data in accordance with the manufacturer's instructions.

With the aircraft engine(s) off and the ELT transmitting, the aural monitor, if fitted, should be heard. If a visual monitor is provided it should be visible from the pilot's normal seated position.

To ensure that the ELT is not susceptible to inadvertent activation by conducted or radiated interference, tests should be conducted with all avionics equipment powered by the aircraft electrical power generating system operating. The test should be carried out with the ELT armed and monitored on both 121.5 MHz and the remote indicator panel and include the following steps:

1. Individually operate each item of electrical equipment and each system, except VHF/UHF communications transmitters, and evaluate all reasonable combinations of control settings and operating modes
2. Individually operate installed VHF/UHF transmitters on various frequencies over their frequency range
3. Repeat the second step with all electronic equipment operating collectively, evaluating reasonable combinations of control settings and operating modes.

## **Maintenance requirements**

### **Scheduled maintenance**

Rule 91.605 requires an operational check of the ELT in accordance with Part 43, Appendix F at intervals not exceeding 12 calendar months or 100 flight hours, whichever is the sooner – transport category aircraft are exempt from the 100 flight hours requirement in accordance with General Exemption 8/EXE/37 issued 20 December 2007. The inspection of the aircraft prior to the issue of a release to service should include the following inspections:

1. ELT, 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 ELT 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 data 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 ELT must be tested for serviceability in accordance with the manufacturer's instructions.

### **Temporary removal of an ELT**

Rule 91.529(c) provides an ability for an aircraft to be operated under Part 91 with an inoperative ELT or without an ELT fitted. This operation is permitted to allow the aircraft to be ferried to a place where repairs to, or installation of, an ELT 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 ELT, or a suitable cockpit location, is required to be placarded Inoperative and the appropriate maintenance entries made in the aircraft log book in accordance with Part 43.