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United Kingdom Civil Aviation Authority

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Automatically Deployable Emergency Locator Transmitter for Helicopters

1 Introduction

1.1 This specification prescribes the minimum performance standards and the installation and maintenance requirements for Automatically Deployable Emergency Locator Transmitter (ADELT) systems installed in helicopters in accordance with the Air Navigation Order 1989 as amended.

NOTE: This Specification also appears as Appendix C to Part 10 of CAP 208 Volume 1.

1.2 Systems complying with alternative specifications may be submitted for approval provided that at least equivalent levels of performance and airworthiness are demonstrated.

1.3 This specification is fully consistent with JTSO 2c91a. It takes account of FAA TSO C91a which references RTCA DO 183 and DO 160A and is in compliance with EUROCAE ED62.

2 Equipment Approval

All ADELT systems submitted for approval shall comply with the following minimum performance standards.

2.1 General

2.1.1 For the purpose of this specification, the ADELT system shall consist of the following items:

a) An Emergency Locator Transmitter (ELT) (paragraph 2.2)

b) An ELT Deployment System (paragraph 2.3)

c) Crash Sensors to activate the deployment mechanism (paragraph 2.4)

d) A Hydrostatic Pressure or Water Detection Switch to activate the deployment mechanism (paragraph 2.5)

e) A means for the flight crew to activate the deployment mechanism (paragraph 2.6)

2.1.2 In addition, an "I" band Radar Transponder may be incorporated within the ELT capable of responding to interrogations after ELT deployment.

2.2 Emergency Locator Transmitter Performance

2.2.1 Operating Life

The transmitter power supply capacity shall be such as to provide continuous operation for at least 48 hours at the declared operating temperatures. Throughout this period of

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continuous operation, the peak effective radiated power shall not be less than that specified in paragraph 2.2.5.

NOTE: If an "I" band Radar Transponder is included (see 2.1.2) the above battery life requirement shall be met with the Transponder in "Standby" mode. The battery life of 48 hours may be reduced to not less than 24 hours under conditions of continuous Radar interrogation.

2.2.2 **Operating Frequencies**

The transmitter shall operate simultaneously on 121.5 and 243.0 MHz. The carrier frequencies shall remain within ±0.005% under all the declared environmental operating conditions.

2.2.3 **Modulation Characteristics**

a) The rf carriers shall be amplitude modulated. The modulation factor shall be at least 0.85.

b) The frequency of the modulating signal shall sweep DOWNWARDS over a range of not less than 700 Hz within the limits of 1600 Hz to 300 Hz with a sweep repetition rate between 2 Hz and 4 Hz.

c) The modulation signal applied to the carriers shall have a minimum duty cycle of 33% and a maximum duty cycle of 66%.

NOTE: The figure specified for modulation factor assumes a sinusoidal modulating signal. In those instances where the waveform of the modulating signal is other than sinusoidal, the modulation factor due to the fundamental component of the modulating signal shall be at least 0.85.

2.2.4 **Emission Characteristics**

a) The type of emission shall be A3A, as defined in the International Telecommunications Union Radio Regulations[1], and shall have one of the following- characteristics.

i) Continuous carrier.

ii) Carrier keyed in such a manner that full power is applied to the antenna for one period, followed by reduced, or zero power for a further period.

The ON/OFF cycle shall be optimised to allow the precise location of the beacon in all weather conditions and to ensure compatibility with all VHF homing equipments currently in service.

NOTE: It has been shown that an ON period of 0.75 seconds followed by an OFF period of 1.5 seconds gives satisfactory results. The ON period should contain a whole number of complete audio 'sweeps'.

b) The ELT shall have clearly defined sideband components which are symmetric about the output signal spectrum and distinct from the carrier component at both the 121.5 MHz and 243 MHz frequencies.

The ELT spectrum at 121.5 MHz shall have at least 30% of its power distribution within a bandwidth of ± 30 Hz about a fixed reference corresponding to the carrier component over the audio/sweep modulation cycle.

At 243 14Hz, 30% of the power distribution shall fall within a bandwidth of ± 60 Hz.

1.Obtainable from International Telecommunications Union, 1211 Geneva 20, Switzerland

c) To aid SAR system detection and homing capabilities, the transmission may also provide a period of unmodulated CW power for a duration of 2.0 seconds, ± 0.25 seconds, repeated every 8.0 seconds, ± 0.8 seconds.

2.2.5 **Effective Radiated Power**

The transmitter Peak Effective Radiated Power (PERP) shall not be less than 75 milliwatts at each carrier frequency.

2.2.6 **Transmitter Activation**

a) Within 5 minutes of transmitter deployment, the PERP shall not be less than that specified in paragraph 2.2.5.

b) The transmitter shall be activated by the action of deployment. A useable transmitted signal should then be immediately available.

c) Normal operational conditions such as mechanical shocks and electromagnetic interference shall not cause transmitter activation.

d) Means shall be provided for manual "switch off" of the transmitter.

NOTE: Procedures and controls provided for installation, maintenance and operating functions should not allow hazardous or faulty operation.

2.2.7 **Seaworthiness**

a) The ELT shall be buoyant and self-righting in fresh and salt water and shall float in such a manner that the signal radiation is essentially omnidirectional and vertically polarised.

b) Up to at least open sea state 7 (equivalent to Beaufort windacale 10) a usable signal shall be provided.

2.2.8 **Case Colour and Design**

a) The colour of the ELT shall be either international orange or fluorescent orange.

b) The ELT case shall have no sharp edges or projections which could damage inflatable survival equipment or injure personnel.

2.2.9 **Resistance to Fire**

The ELT case shall not support combustion.

2.3 **Emergency Locator Transmitter Deployment System**

2.3.1 **Deployment System Activation** The deployment system shall be capable of activation by the means specified in paragraphs 2.4, 2.5 and 2.6. The risk of inadvertent deployment due to faults or normal operating conditions including mechanical shocks and electromagnetic interference shall be minimised.

2.3.2 **Emergency Locator Transmitter Ejection**

a) Deployment of the ELT in any normal flight condition shall not hazard the helicopter. Deployment while the helicopter is on the ground shall be such that the possibility of injury to personnel is minimal.

b) The radio transmitter shall meet the requirements of paragraph 2.2 after surfacing on the water following ejection over the range between 200 feet above and 15 feet below the water surface.

2.3.3 **Deployment System Operation** The risk of deployment not taking place when required shall be minimised by close attention to the likely disruptive effects due to a crash or ditching as well as to the effect of the normal operating environment.

2.4 **Crash Sensors**

A means of detecting the crash shall be provided which may consist of one or more, or a combination of the following:

2.4.1 **Frangible Switches** These are required to operate when the crash sensitive structure distorts under the crash situation.

2.4.2 **Inertia Switch** The inertia switch shall have a minimum switching threshold of 6g with a minimum velocity increment of 3 feet per second.

2.5 **Hydrostatic Pressure or Water Detection Switch**

This shall be activated by water pressure, or the presence of water, resulting from submersion of the helicopter fuselage.

A pressure equivalent to a water depth of 10 feet, (5 PSI), is recommended for the switching threshold of a hydrostatic pressure switch.

2.6 **Flight Crew Operated Deployment Switch**

This shall be guarded but easily operable by the flight crew, either in flight or after alighting.

2.7 **Environmental Standards**

2.7.1 The ADELT System shall be designed in accordance with BCAR Section R and either Section G or 29 and subjected to type approval tests in accordance with the requirements of:

a) The relevant parts of British Standard BS 3G100[1] or

b) RTCA/EUROCAE document DO_160C/ED14C[2] (ISO 7137)

or

c) Other acceptable specifications and shall show compliance with the relevant requirements of this specification throughout the environmental ranges appropriate to the equipment installation and the equipment operational locations.

NOTE: Other documents containing more specific standards, test procedures etc., for Emergency Radio Transmitters are:-

a) CAP 208 Vol 1 Section 10[3]

b) RTCA Documents DO 183 and DO 192[4]

c) TSO C91a[5]

d) EUROCAE MPS No. 1/ED/62[2]

2.7.2 The Applicant for equipment approval shall produce a Declaration of Design and Performance (DDP) which provides the information required by BCAR Section A and B Chapter A/B 4-8 and Section R Chapter R3-l Approval of the equipment will be on the basis of the information given in the DDP.

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1. Obtainable from British Standards Institution, 2 Park Street, London W1Y 4AA
2. Obtainable from EUROCAE, 11 Rue Hamelin - 75783 Paris Cedex 16, France
3. Obtainable from Civil Aviation Authority, Printing and Publication Services, Greville House, 37 Gratton Road, Cheltenham, Gloucestershire GL50 2BN
4. Obtainable from RTCA, One McPherson Square, 1425 K Street N.W., Suite 500, Washington DC 20005, USA.
5. Obtainable from FAA, Office of Airworthiness (AWS-l00), 800 Independence Ave, S.W., Washington DC 20591, USA.

3 Installation

3.1 General

3.1.1 The ADELT shall be of an approved type and shall be installed in accordance with the requirements of BCAR Section R and either Section G or 29.

3.1.2 The ADELT and its system components (e.g. sensors and switches) shall be so installed that under operational conditions, the environment shall be within the limits to which the equipment has been declared.

3.2 Installation and Location of System Components

3.2.1 **Location** The ADELT shall be located so that the ELT ejection trajectory will not hazard the helicopter in any normal flight condition. It shall not be located on moveable surfaces or in such a way that the helicopter flight and operating characteristics are adversely affected and shall be located so as to give the best chance of survival to deploy and operate after an emergency alighting on water.

3.2.2 **Crash Detector Installation** Impact sensitive devices, such as frangible or inertia switches, shall be provided in sufficient numbers and shall be so positioned and aligned as to ensure that a crash in any likely attitude (e.g. nose or tail down) will be detected.

3.2.3 **Hydrostatic Pressure or Water Detection Switches** At least one hydrostatic pressure or water detection switch is required which shall be installed in an unsealed area, immediately adjacent to the deployment mechanism, so that it will operate if the helicopter sinks.

NOTE: Protection from high pressure hoses used during aircraft cleaning operations may be required.

3.2.4 **Flight Crew Operated Deployment Switch** A switch is required which shall be guarded and labelled to minimise the risk of unintentional operation and shall be located within easy reach of the flight crew whilst seated at their normal stations.

3.2.5 **System Interference** Precautions shall be taken to ensure that the connection of the ADELT system to other aircraft systems will not either under normal or fault conditions, significantly affect those aircraft systems.

3.2.6 **Electrical Supply**

a) The electrical supply for the deployment system shall be from a source which provides maximum integrity for the system operation under crash conditions including sinking. An independent battery shall be provided to supply power via the hydrostatic pressure or water detection switch for the operation of the ELT deployment mechanism. It shall be located immediately adjacent to the deployment mechanism.

b) Where applicable, the replacement date for batteries shall be clearly marked. This marking shall be in such a position that it can be easily read by maintenance personnel.

3.2.7 **Accessibility of Controls** Controls which are not intended to be adjusted by the flight crew shall not be readily accessible.

3.2.8 A restraining device shall be provided to prevent inadvertant ELT ejection during ground operations and maintenance. The device shall be so conspicuous that it is unlikely to be left in place prior to flight.

4 Tests

Any ground or flight tests necessary to demonstrate compliance with this Specification shall be agreed with the CAA.

5 Operation

Operation is automatic except when deployment is initiated by the switch intended for pilot operation.

Crew procedures should include monitoring on an opportunity basis, of the VHF Emergency Channel (121.5 MHz) in order to detect intended and unintended transmissions with a final check of the Emergency Channel after engine shut down.

6 Maintenance

Operators will be required to make provision in their Maintenance Schedules for periodic system checks of sensor circuits and ELT transmission etc. and for the replacement of the batteries. The extent of the checks and the frequency of both the checks and the battery replacement shall be based on the manufacturers recommendations and be agreed with the CAA.