



The European Organisation for Civil Aviation Equipment
L'Organisation Européenne pour l'Équipement de l'Aviation Civile

MINIMUM OPERATIONAL PERFORMANCE SPECIFICATION FOR AIRCRAFT EMERGENCY LOCATOR TRANSMITTERS 406 MHz and 121.5 MHz (Optional 243 MHz)

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ED-62A

February 2009

Supersedes

Document ED-62

May 1990

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FOREWORD

- 1) This document, prepared by EUROCAE Working Group 74, was accepted by the Council of EUROCAE on 12 February 2009.
- 2) EUROCAE is an international non-profit making organisation. Membership is open to users and manufacturers, in Europe, of equipment for aeronautics, trade associations and, under certain conditions, non-European Members. Its work programme is directed to the study of technical problems facing users and manufacturers of equipment for aeronautics and all related topics. It aims to contribute at national and international levels to the solution of such problems.

The findings of EUROCAE are resolved after discussion among members of EUROCAE, European airlines and interested administrations, and in collaboration with the Radio Technical Commission for Aeronautics (RTCA), Washington, DC.

- 3) This document supersedes the ED-62 "Minimum Operational Performance Specification for Aircraft Emergency Locator Transmitters (121.5/243 MHz and 406 MHz)" dated May 1990.

As compared with the previous document, the main changes are:

- a. the requirement for 243 MHz frequency have been removed,
 - b. the use of direct reference to Cospas-Sarsat Documents C/S T.001 and C/S T.007 when applicable,
 - c. the Equivalent Isotropic Radiated Power (EIRP) of the 121.5MHz homing signal has been reduced to 50 mW,
 - d. the introduction of Position Data considerations,
 - e. the new Chapter 6 Installed Equipment Performance give guidance to the ELT manufacturer on items to be specified in customer supplied documentation to ensure proper installation,
 - f. the new Chapter 7 Operational Tests, give guidance to the ELT manufacturer on items to be specified in customer supplied documentation to ensure continued performance standards,
 - g. the introduction of two types of Survival ELT (S) Class A (buoyant) and ELT (S) Class B (non buoyant)
 - h. the requirement for the power source to enable a minimum self-test interval of once every 6 months.
 - i. the requirement that the ELT transmits during self-test by compliancy to Cospas-Sarsat Beacon Test Mode.
- 4) Co-ordination of this document has been achieved with RTCA SC-204 during the preparation of DO-204 "MOPS for 406 MHz Emergency Locator Transmitters (ELT), December 6, 2007.

There is no significant difference between this document and DO-204A.

The addition of Encoded navigation Data has been defined as Optional.

In the preparation of this document, EUROCAE Working Group 74 also gave consideration to RTCA Documents DO-182 "Emergency Locator Transmitter Equipment Installation and Performance", November 1982,

- 5) This MOPS contains technical specifications coordinated with the requirements of the COSPAS-SARSAT Secretariat as published in the document "Specifications for COSPAS-SARSAT 406 MHz Distress Beacons" (C/S T.001).

Users of this MOPS should refer to C/S T.001 and C/S G.005 for details on beacon coding which are not included in this document. Test procedures are coordinated with C/S T.007, and Table of Frequencies are included in C/S T.012.

- 6) Where documentation is referenced in the text, the edition current at the time of writing has been used. Future updates of reference documents may be used subject to the agreement of the approving authority.
- 7) EUROCAE Minimum Operational Performance Specifications are recommendations only. EUROCAE is not an official body of the European Governments; its recommendations are not valid as statements of official policy unless adopted by a particular government or conference of governments.

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CHAPTER 1

INTRODUCTION

1.1 PURPOSE AND SCOPE

This document contains minimum operational performance specifications for Emergency Locator Transmitters, (ELT), to ensure that they will:

- meet the environmental constraints of a crash,
- meet COSPAS-SARSAT system requirements for satellite processing of distress signal (primary alert),
- be compatible with homing devices used for Search And Rescue (SAR),
- not adversely affect normal aircraft operations.

The word "equipment", as used in this document, includes all components and units necessary for the ELT to properly perform its intended functions; for example, the "equipment" may include a battery power supply, a transmitter, a crash sensor (with transmitter activation circuits), antenna, remote monitor and control unit, interconnecting cables, and mounting brackets and hardware. In this example, the "equipment" comprises all of the foregoing components and units. However, it should not be inferred from this example that every ELT design will necessarily include all of the foregoing items. This will depend on the specific design chosen by the manufacturer.

1.2 TYPES OF ELT

Four basic types of ELT are described in this document. They are: Automatic Fixed (ELT (AF)), Automatic Portable (ELT (AP)), Survival (ELT (S)) and Automatic Deployable (ELT (AD)). In addition each type of ELT may be manufactured to Class 1 or Class 2 operating temperature requirements.

The use of the suffix "Automatic" is for editorial purpose and is not intended to preclude the design, manufacture or use of manually activated ELTs. The requirement for and approval of automatic or manual activation methods is the prerogative of individual approval authorities.

For definition purpose:

- ELTs activated by the shock of the crash are called Automatic. Hydrostatic activation for ELT(AD) is also considered to be Automatic.
- For any other type of activation, the ELTs are called Manual.

Emergency Locator Transmitters are designed only for emergency use. The four basic types of ELTs are described below:

1.2.1.1 Automatic Fixed (ELT (AF))

This type of ELT is intended to be permanently attached to the aircraft before and after a crash and is designed to aid SAR teams in locating a crash site.

1.2.1.2 Automatic Portable (ELT (AP))

This type of ELT is intended to be rigidly attached to the aircraft before a crash, but readily removable from the aircraft after a crash. It functions as an ELT (AF) during the crash sequence. If the ELT does not employ an integral antenna, the aircraft-mounted antenna may be disconnected and an auxiliary antenna (stored on the ELT case) connected in its place. The ELT can be tethered to a survivor or a life raft. This type of ELT is intended to aid SAR teams in locating the crash site or survivor(s).

1.2.1.3 Survival (ELT (S))

The ELT shall survive the crash forces, be capable of radiating a signal, have an aural and/or visual indication that power is on.

If the antenna is not designed to be stowed in its normal operating position, it shall be deployable to the designed length and operating position in a simple and reliable manner.

If the antenna or its sections can be taken apart and detached from the ELT, they shall be secured against loss.

a. ELT (S) Class A (buoyant)

This type of ELT is intended to be removed from the aircraft, deployed and activated by survivors of a crash. It can be tethered to a life raft or a survivor. Activation of an ELT (S) is usually by manual means but automatic activation (eg: by water activation) may apply.

The equipment shall be buoyant and it shall be designed to operate when floating in fresh or salt water, and shall be self-righting to establish the antenna in its nominal position in calm conditions.

b. ELT (S) Class B (non buoyant)

This type of ELT shall be integral to a buoyant device in the aircraft, deployed and activated by the survivors of a crash. Activation of the ELT is usually by manual means but automatic activation (eg by water activation) may apply.

1.2.1.4 Automatic Deployable (ELT (AD))

This type of ELT is intended to be rigidly attached to the aircraft before a crash and automatically deployed after the crash sensor has determined that a crash has occurred. This type of ELT shall float in water and is intended to aid SAR teams in locating the crash site.

1.2.2 A 406 MHz ELT designed and manufactured to the standards contained in this document is intended to be used as part of a combined equipment or may be a "stand-alone" unit adjunct to a 121.5/243.0 MHz ELT. If designing a standalone 406 MHz ELT disregard the 121.5 MHz portion of this document.

1.3 COSPAS-SARSAT SYSTEM OVERVIEW

Refer to COSPAS-SARSAT web site, www.cospas-sarsat.org for detailed information.

1.4 DEFINITIONS

ALIVENESS TEST

An aliveness is intended to give a status of the ELT main parameters as defined in [§4.3.3](#).

ANTENNA GAIN

Directional gain of an antenna with respect to an isotropic radiator multiplied by antenna efficiency.

AUXILIARY ANTENNA

An antenna which is stowed on the ELT case and can be connected to the ELT (AP) after a crash.

COSPAS

COsmicheskaya Sistyema Poiska Avariynykh Sudov

(Space System for the Search of Distressed Vessels).

CRASH SENSOR

A device which detects a crash and initiates the transmission of emergency signals.

EIRP

Effective Isotropic Radiated Power is the output power at the transmitter terminal, minus feeder and mismatch losses, plus average antenna gain relative to an isotropic radiator in the horizontal direction, or:

$$\text{EIRP} = \text{PT} - \text{L} + \text{GA}$$

where	PT (dBW)	=	output power,
	L (dB)	=	feeder and mismatch losses,
	GA (dB)	=	antenna gain

ELT

Emergency Locator Transmitter

ELT EQUIPMENT

ELT Unit and all components external to the ELT required for it to perform its intended function, e.g., remote indicator and control unit, mounting bracket, cabling, antenna(s), position data interface and storage.

ELT UNIT

That portion of the ELT equipment which contains at least the power supply, power switching and transmitter.

EXTERNAL ANTENNA

An antenna intended for location and use external to the aircraft. Usually mounted on the exterior surface of the aircraft.

FIM

Field Intensity Meter: a calibrated radio receiver or other device used for measuring field intensity.

FIXED ANTENNA

An antenna which is rigidly mounted to the aircraft structure.

Gth

Threshold acceleration. An acceleration level below which the crash sensor shall not activate.

INTEGRAL ANTENNA

An antenna that cannot be detached from the ELT unit.

LUT

Local User Terminal

MCC

Mission Control Centre.

NRZ

Non Return to Zero.

RCC

Rescue Coordination Centre.

REMOTE INDICATOR AND CONTROL UNIT

All devices, mounting and cabling required to provide;

- a. An ON,function
- b. A RESET function
- c. A Self-Test function
- d. A cockpit indication

RHCP

Right hand circular polarisation.

SARSAT

Search and Rescue Satellite-Aided Tracking system.

SHOCK TESTER

A device for generating an appropriate impulse with adjustable magnitude, duration and shape (eg: ramp, drop tower, shock table).

TETHER

A means of attachment (typically a strong flexible cord) to provide a mechanical connection between two components or items.

CHAPTER 2

GENERAL DESIGN REQUIREMENTS

(121.5/243.0 MHz and 406 MHz ELTs)

2.1 AIRWORTHINESS

The design and manufacture of ELT equipment shall not, under normal or fault conditions, impair the airworthiness of the aircraft in which it is installed or carried, or the safety of persons on board.

2.2 INTERNATIONAL TELECOMMUNICATIONS UNION

The equipment shall comply with the relevant ITU Radio Regulations and the applicable local telecommunication rules (FCC, IC,...).

2.3 FIRE PROTECTION

Except for small parts (such as knobs, fasteners, seals, grommets and small electrical parts) which would not contribute significantly to the propagation of a fire, all materials used shall be self-extinguishing, and comply with FAR / CS 25.853 . In addition, the ELT is expected to survive post-crash fires as described in [§ 4.5.11](#) and [§ 4.5.12](#) as applicable.

2.4 OPERATION OF CONTROLS

The design of the equipment shall be such that the controls intended for operational use cannot be operated in any position, combination or sequence, which would result in a condition detrimental to the operation or reliability of the equipment.

2.4.1 Accessibility of controls

For installation requirement refer to [§6.1](#).

2.4.2 Controls on ELT unit

The control on the ELT unit shall enable selection of at least following functions:

- OFF: Transmitter disabled and not in the "ARMED" mode. The OFF mode shall not be available from the pilot normal seated position.
- MANUAL ON: Transmitter manually activated
- ARMED: Transmitter enabled such that activation will occur in response to a correct crash sensor input (does not apply to to ELT (S)).
- RESET: Operating transmitter deactivated and return to "ARMED" (does not apply to ELT (S)). The control must have a provision to prevent inadvertent reset.

NOTE: *More than one function may be combined in the same control.*

2.4.3 Remote Control and Monitoring System

A means of automatically monitoring the ELT activation (§2.4.1) is required due to the unacceptable number of false activations that have occurred with existing ELTs. Two simultaneous methods of alerting the cockpit or ground crew that the ELT has been activated are required:

- a. A visual method to alert the cockpit crew during periods when the aircraft engines are operating; and
- b. An aural alarm with a maximum sound level such that it will not distract the cockpit crew during flight conditions but will be audible during ground operations and servicing when the engine(s) are not operating.

An Automatic ELT Remote Control and Monitoring System shall have the following functions:

- Activate the ELT manually
- Alert the flight crew if the ELT is inadvertently activated
- Allow resetting of the ELT

The Remote Control shall not have an OFF position.

It shall also provide the flight crew with the means of testing the operation of the ELT system prior to flight.

2.5 SELF-TEST

Self-Test activation shall be designed such that the ELT automatically returns to its previous state (eg: spring-loaded switch or push button).

2.5.1 406 MHz transmitter

ELTs shall include a Self-Test function designed to as a minimum,

- a. Assure that the battery has enough power for the ELT to operate at specifications.
- b. Assure that transmitter power is at specifications.
- c. Comply with "Beacon Self Test Mode" as described in C/S T.001.

2.5.2 121.5 MHz transmitter

A Self-Test function shall be provided on 121.5 MHz ELTs

The Self Test circuitry shall be so designed that the duration of any transmission made during Self Test operation shall not exceed 3 sweeps.

2.6 INSTALLATION ORIENTATION

If the equipment contains a crash sensor, that part of the equipment containing the crash sensor shall be clearly marked by the ELT manufacturer to indicate the correct installation orientation(s), if appropriate, for crash sensing.

This does not apply to ELT (S).

2.7 CASE DESIGN AND COLOUR

2.7.1 The exterior of the equipment shall have no sharp edges or projections which could damage inflatable survival equipment or injure persons.

2.7.2 ELT controls shall be protected to minimise the risk of inadvertent activation of the ELT and the possibility of deactivating the ELT by flying debris during a crash, or personnel egress following a crash.

2.7.3 Instructions for disabling the unit for storage or disposal shall be clearly and simply presented on the outside of the case. For all (AP) and (S) type units, clear instructions for use shall also be provided.

2.7.4 All ELT units shall be predominantly of a high visibility yellow or orange colour, except for those portions of (AD) units that are on the exterior surface of the aircraft.

2.8 POWER SOURCE

2.8.1 The equipment shall have its own power source and shall not be dependent upon the aircraft power supply for transmitter operation.

2.8.2 If designed to be user-replaceable, the power source shall not require any special tools, fixtures or soldering for installation in the field, and any interface connections shall be accomplished in a manner to ensure maximum reliability and preclude reversed polarity or incorrect installation. Provision shall be made to ensure the watertight integrity of the ELT upon replacement of the power source.

- 2.8.3 The ELT circuitry shall be protected from venting products of the power source.
- 2.8.4 The ELT manufacturer should establish a useful life and an expiration date for batteries. The useful life is defined as the period of time after the battery manufacture date that the battery will continue to meet the input power requirements of the ELT, as determined by the ELT manufacturer, when the ELT is stored at +20°C.
- 2.8.5 The ELT battery useful life shall be specified by the ELT manufacturer to meet the requirement of [§3.2.3](#) and shall not be greater than one half of the cell manufacturer's stated shelf life at 20°C and shall be related to the cell's date of manufacture. The expiry date shall be clearly and conspicuously marked on an external label.
- NOTE:** *The ELT manufacturer shall justify the specified shelf life with supporting data supplied by the battery manufacturer. The 'one-half' factor may need to be reduced according to the battery chemistry used and/or the expected stowage environment.*
- 2.8.6 The use of rechargeable cells is undesirable. Manufacturers wishing to propose their use should refer to the appropriate approval authority.
- 2.8.7 The manufacturer may provide for the use of the aircraft battery or any other supplemental power supply for remote control and/or monitor functions provided that other requirements of this specification are not compromised.
- 2.8.8 For Lithium batteries refer to RTCA DO-227.
- 2.8.9 The battery source shall provide sufficient capacity for a self-test to be conducted according to the period specified by the manufacturer or at least once a month according to Cospas-Sarsat requirement and tested in [§4.6.1](#).

2.9 TEMPERATURE AND ALTITUDE RANGES

- 2.9.1 Two classes of ELT (Class 1 and Class 2) are described in this document. Manufacturers shall declare in which class the ELT is designed.
- 2.9.2 The temperature and altitude testing criteria for ELTs are:

	<u>Class 1</u>	<u>Class 2</u>
Low Operating Temperature	-40°C	-20°C
High Operating Temperature	+55°C	+55°C
Low Non-operating (stowed) Temperature	-55°C	-55°C
High Non-operating (stowed) Temperature	+85°C	+85°C
High Operating Altitude	10 700m (35 000ft)	
High Non-operating Altitude	15 200m (50 000ft)	

2.10 WATERPROOFNESS

The ELT unit shall be waterproof. Standing water on the outer surface of the ELT unit shall have no effect on the performance of the equipment.

2.11 IMMERSION IN SALT WATER

The ELT unit performance shall not be affected after it has been totally immersed in salt water.

2.12 FIRE RESISTANCE

- 2.12.1 All ELTs, including antenna(s) and antenna cabling shall be capable of withstanding exposure to fire or flame to a degree at least as represented by the Flame Test of Chapter 4, paragraph [4.5.11](#).

2.12.2 Two levels of test are prescribed:

- a. Flame Test - All ELTs;
- b. Fire Test (Optional). - ELT (AF) (AP)

2.13 EFFECTS OF TESTS

The design of the equipment shall be such that the application of specified test procedures shall not be detrimental to equipment performance following the application of these tests, except as specifically allowed.

2.14 SOFTWARE CONTROL

Software design shall follow the guidelines specified in document ED-12B/DO-178B. The software criticality and level will depend on the particular equipment function and application.

2.15 ADDITIONAL REQUIREMENTS

2.15.1 Automatic Fixed (AF) Equipment

The ELT (AF) **shall** have the means to detect occurrence of a crash, automatically activate the transmitter and radiate a signal through an antenna. Aural and visual monitors **shall** be provided to alert the cockpit crew that the ELT has been activated and is transmitting. ELT controls **shall** be available from a cockpit crew member's position.

The ELT equipment **shall** incorporate an antenna for remote mounting (external or internal to the aircraft), or an antenna integral to the ELT unit. Means **shall** be provided to prevent antennas from interfering with normal operation of the aircraft or with its occupants. If the antenna is not attached directly to the ELT unit, it **shall** be connected to the ELT unit by means of a suitable RF cable resistant to accidental disconnection.

2.15.2 Automatic Portable (AP) Equipment

The ELT (AP) **shall** meet the requirements of §2.15.1. In addition, it **shall** include an auxiliary antenna and a tether. If the antenna is integral to the ELT, and the ELT is readily accessible and removable as an entity, an auxiliary antenna is not required. The unit **shall** be designed so that it may be removed from the aircraft, deployed, controls activated and antenna erected, all without use of tools. The equipment **shall** also meet the following requirements:

a. Waterproofness

The equipment, exclusive of water-activated batteries, **shall** be waterproof, refer to [§2.10](#).

b. Portable Alert

If the crash sensor is not automatically disabled when the ELT is removed from the aircraft mounting, an audible indication must be installed that activates when the ELT is transmitting.

An (AP) ELT can only be labelled as (S) if it fully meets the requirements of (S) beacons.

2.15.3 Survival (S) Equipment

The ELT (S) shall survive the crash forces specified in Chapter 4, be capable of radiating a signal, have an aural and/or visual indication that power is on and shall meet the following requirements.

2.15.3.1 Antenna

If the antenna is not designed to be stowed in its normal operating position, it shall be deployable to the designed length and operating position in a simple and reliable manner. If the antenna or its sections can be taken apart and detached from the ELT, they shall be secured against loss.

2.15.3.2 Labelling

Simple operating instructions in English, clearly readable and durable, shall be permanently affixed to the equipment.

2.15.3.3 Equipment Deployment and Activation

The equipment shall be designed so that it may be brought into operation using one hand. The activation mechanism of the transmitter shall incorporate measures to minimise inadvertent activation.

2.15.3.4 Tether

A tether shall be provided to secure the ELT to a person or life raft.

2.15.3.5 Buoyancy:

The ELT shall be designed in order to satisfy the requirements for ELT (S) Class A or Class B as applicable.

2.15.4 Automatic Deployable (AD) Equipment

2.15.4.1 The ELT (AD) shall meet the requirements of paragraph [2.15.1](#) while installed in the aircraft.

2.15.4.2 The antenna is required to be integral to the ELT during and after a crash and is not required to be rigidly fixed to the aircraft before a crash.

2.15.4.3 The equipment shall have provision for manual deployment before a crash, and automatic deployment during a crash.

2.15.4.4 The equipment shall be buoyant and, when floating in fresh water or salt water, shall be self-righting and sufficiently stable to maintain the antenna substantially in its normal operating position

2.15.4.5 The location of the ELT (AD) and its manner of installation shall be such as to minimise the risk of injury to persons or damage to the aircraft in the event of inadvertent activation.

2.16 POSITION DATA (OPTIONAL)

If such a function is provided the storage of the position data and the interface between ELT and storage of the position data shall be located in a protected area meeting the Chapter 4 performance criteria.

To ensure ELT compatibility with Cospas-Sarsat receiving and processing equipment, ELTs shall meet all the position data requirements specified in the Cospas-Sarsat document C/S T.001.

CHAPTER 3

MINIMUM PERFORMANCE SPECIFICATIONS UNDER STANDARD TEST CONDITIONS

3.1 MINIMUM PERFORMANCE SPECIFICATION - 121.5 MHZ (243 MHZ OPTIONAL) HOMING TRANSMITTER

3.1.1 Operating Frequencies

The transmitter **shall** operate on 121.5 MHz and optionally at a frequency of 243.0 MHz. The carrier frequencies **shall** remain within $\pm 0.005\%$ under all environmental operating conditions.

3.1.2 Modulation Characteristics

3.1.2.1 The RF carriers shall be amplitude modulated. The modulation factor shall be at least 0.85 but shall not exceed 1.0. (see Figure 3-1)

NOTE: *The figure specified for modulation factor assumes a sinusoidal modulating signal. If 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.*

3.1.2.2 Voice modulation is permissible provided that it is consistent with the ELTs primary function. Voice modulation (ITU-A3E) shall not consume energy from the power supply at a rate greater than that of normal ELT swept tone modulation (ITU-A9 or A3A). The ELT manufacturer shall provide marking on the external surface of the ELT cautioning users that voice transmissions should be minimized.

3.1.2.3 The modulation factor shall be defined with respect to the maximum and minimum amplitudes of the modulation envelope by the following formula:

$$\text{Modulation Factor} = \frac{A - B}{A + B}$$

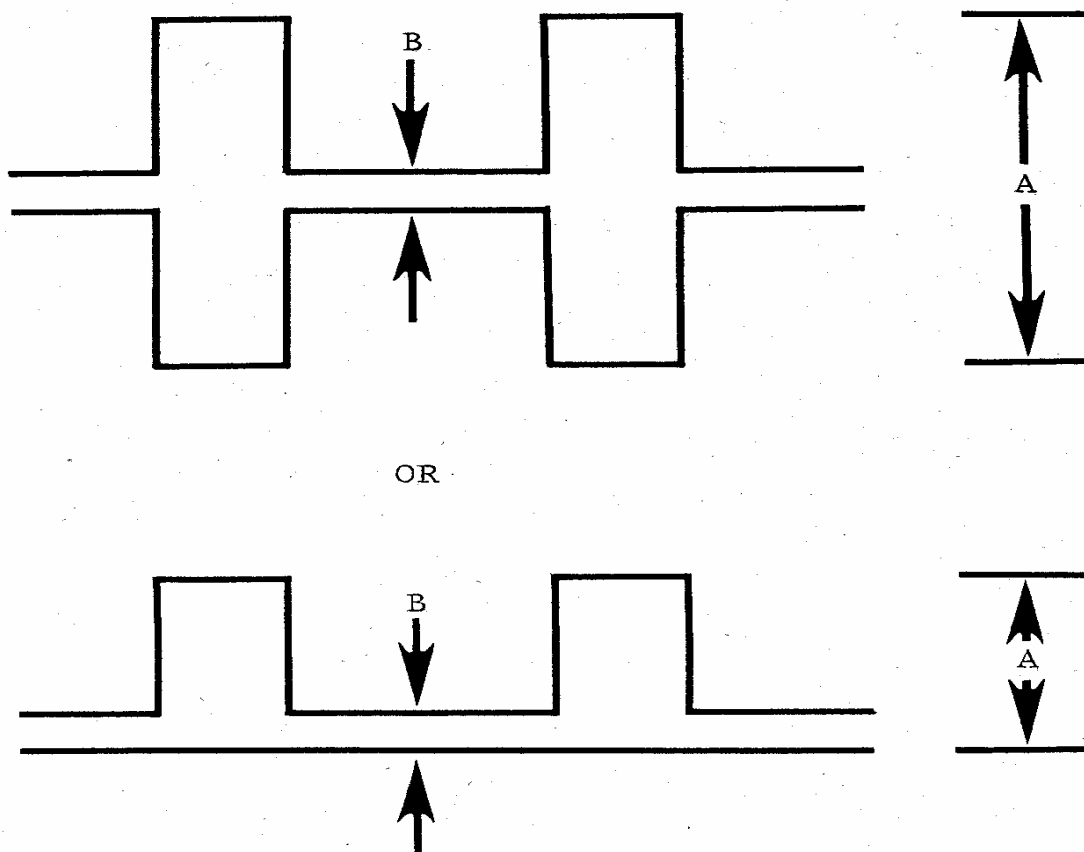


FIGURE 3-1: DEFINITION OF MODULATION FACTOR

- 3.1.2.4 The frequency of the modulating signal shall sweep DOWNWARDS over a range of not less than 700 Hz within the limits of 1 600 Hz to 300 Hz with a sweep repetition rate between 2 Hz and 4 Hz.
- 3.1.2.5 The modulation signals applied to the carriers shall have a minimum duty cycle of 33% and a maximum duty cycle of 55%. (see Figure 3-2).

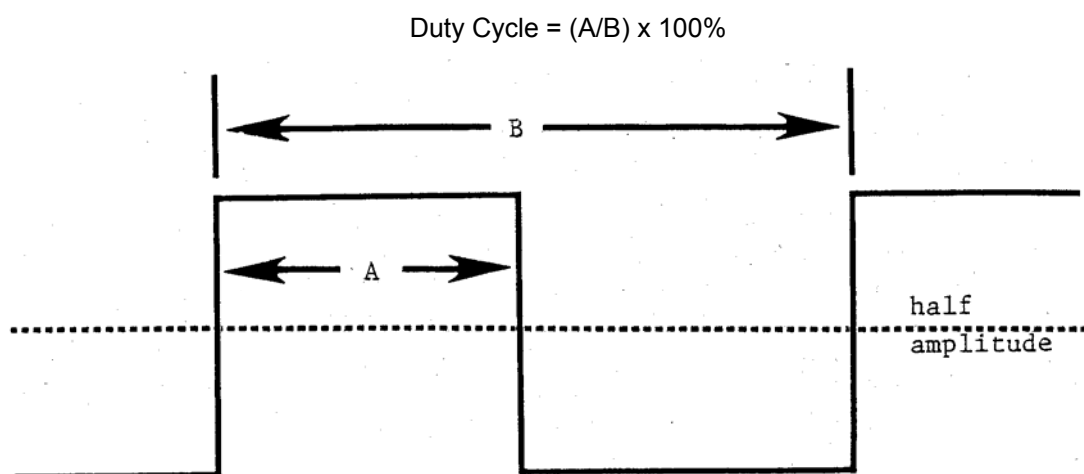


FIGURE 3-2: DEFINITION OF MODULATION DUTY CYCLE

3.1.3 Emission Characteristics

3.1.3.1 The type of emission shall be A3A, as defined in the ITU Radio Regulations, and shall have one of the following characteristics:

- a. continuous carrier.
- b. 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 equipment 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.*

3.1.3.2 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 243.0 MHz frequencies.

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

At 243 MHz 30% of the energy distribution shall fall within a bandwidth of $f_c + 60$ Hz.

3.1.3.3 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 (+/-0.25) seconds, repeated every 8.0 (+/-0.8) seconds.

3.1.3.4 Voice modulation, (ITU-A3E), is permitted provided that its use shall not prejudice the primary function of the beacon and power shall not be consumed at a greater rate than in the beacon mode.

Such equipment shall also comply with the following requirements:

- a. the equipment shall be clearly marked to caution operators to use the speech facility only when the rescue craft is seen or heard.
- b. where a speech facility is provided on 121.5/243 MHz the Transmitter/Receiver key must revert to beacon operation when not actually being keyed.
- c. where a second, auxiliary speech channel is provided it must operate on 123.1 MHz, (scene of the search frequency), and shall provide the same reversion to Beacon mode on 121.5/243 MHz as in b. above.
- d. the Operator Instruction Manual must warn the user that when the speech facility is used, the homing capability is severely restricted or non-existent.

3.1.3.5 An identification signal is permitted using the International Morse Code. If this option is incorporated,

- a. the identification signal shall consist of 5 or 6 letters, (the aircraft registration), at a repetition rate of once per minute;
- b. the carrier shall be modulated ITU-A3A by 1 020 (+/-50) Hz;
- c. the keying rate shall be as follows.
 - 1 dot = 115 (+/-10) ms
 - 1 dash = 3 dots
 - space between morse digits = 1 dot
 - space between coded letters = 1 dash