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# Minimum Operational Performance Standards for Emergency Locator Transmitters

## Automated Fixed – ELT (AF)
## Automatic Portable – ELT (AP)
## Automatic Deployable – ELT (AD)
## Survival – ELT (S)

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# F O R E W O R D

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# 1.0 PURPOSE AND SCOPE

## 1.1 Introduction

This document sets forth minimum operational performance standards for Emergency Locator Transmitters (ELTs). Incorporated within these standards are system characteristics that will be beneficial to users, designers, manufacturers and installers.

Section 1.0 of this document provides information needed to understand the rationale for equipment characteristics and requirements stated in the remaining sections. It describes typical equipment applications and operational goals, as envisioned by the members of Special Committee 136, and is the basis for the standards stated in Sections 2.0 through 4.0. Definitions and assumptions essential to proper understanding of this document are also provided in Section 1.0.

Section 2.0 contains the minimum performance standards for ELT equipment. These standards define the required performance under standard operating conditions and stressed physical environmental conditions. It also details the recommended bench test procedures necessary to demonstrate compliance.

Section 3.0 describes the performance required of the installed equipment. Tests for the installed equipment are included when performance cannot be adequately determined through bench testing.

Section 4.0 describes the operational characteristics for equipment installations and defines conditions and tests that will assure the operator that operations can be conducted safely and reliably in the expected operational environment.

Compliance with these standards by manufacturers, installers and users is recommended as a means of assuring that the equipment will satisfactorily perform its intended function(s) under conditions encountered during and following crash situations. Additionally, adherence to these standards should assure that the ELT will not adversely affect normal aircraft operations.

If the equipment implementation includes a computer software package, the guidelines contained in RTCA/DO-178, "Software Considerations in Airborne Systems and Equipment Certification," November 18, 1981 should be considered.

It is recognized that any regulatory application of this document in whole, or in part, is the sole responsibility of appropriate governmental agencies.

Since the measured values of equipment performance may be a function of the measurement method, standard test conditions and methods of test are recommended.

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

## 1.2 System Overview

This document contains minimum operational performance standards for ELTs installed primarily in fixed-wing aircraft. Survival type ELTs are also included but are not required to meet the crash activation, remote monitoring and installation requirements specified for the other types of ELTs. ELTs, other than Survival ELTs, automatically sense that a crash has occurred and then broadcast distinctive amplitude-modulated signals on 121.5 and 243.0 MHz. As a minimum, the transmitter portion of the equipment contains a highly stable frequency source, modulators, RF amplifiers and batteries. Omni-directional antenna(s), crash activation sensors associated with a transmitter activation circuit, a means to control the desired state of the transmitter "OFF-ARMED-ON-RESET", interconnecting cables (if needed), and mounting brackets and hardware (to rigidly affix the ELT to the aircraft's primary load-carrying structures) are part of the equipment. Means are provided to inform the pilot of transmitter activation. A remote control to deactivate the transmitter may be required if the ELT is not readily accessible from the pilot's position. The ELT may be designed to be portable after the crash, which would require an auxiliary antenna and a tether (to be attached to a raft or person) as part of the equipment. The ELT may also be designed for automatic ejection from the aircraft and deployment after a crash. The components necessary to accomplish this would then be part of the ELT equipment.

The ELT is one element of the Search and Rescue (SAR) system. It is designed to survive a crash and harsh natural environments, and to provide an immediate alert and homing signal to assist rescue parties in locating the emergency site.

An additional element of the SAR system is composed of various airborne and ground VHF and UHF receivers capable of detecting and homing on the ELT signals. Initial detection of ELT transmissions is accomplished mainly by aircraft operating within radio range (line-of-sight) of the emergency location. Typical aircraft communication system sensitivities were considered in developing these standards.

The use of satellites to monitor and locate the sources of ELT transmissions is being investigated to further reduce the elapsed time between the crash and arrival of rescue personnel. Optional transmission characteristics are specified to enhance the signal reception capability by the satellite and SAR aircraft. These transmission characteristics will have a negligible effect on the primary signal characteristics.

## 1.3 Operational Applications

Emergency locator transmitters are designed only for emergency use. The four basic types of ELTs are discussed below.

a. 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.

b. Automatic Portable - ELT (AP)

This type of ELT is intended to be rigidly attached to the aircraft before the 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) attached to the ELT. 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).

c. Survival - ELT (S)

This type of ELT does not normally activate automatically