The National Search and Rescue Secretariat

406 megahertz (MHz) Personal Locator Beacon

Performance Document (NSS-PLB)

BUILDING A SAFE AND RESILIENT CANADA

Canada

This document is for beacon manufacturers seeking to market and sell 406 megahertz (MHz) Personal Locator Beacons (PLBs) in Canada.

Aussi disponible en français sous le titre : Document de rendement du Secrétariat National de Recherche et de Sauvetage pour les balises de localisation personnelle (BLP) de 406 megahertz (MHz)

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1.0 Scope

1.1 Personal Locator Beacons in Canada

This document contains the minimum requirements for the functional and technical performance of Personal Locator Beacons (PLBs) operating in the 406.0 to 406.1 megahertz (MHz) band through low earth polar-orbiting, medium earth orbiting and geostationary satellite systems[1], to obtain a Letter of Recommendation for Approval (LRA) from the National Search and Rescue Secretariat (NSS), Public Safety Canada.

As per Radio Standard Specification 287 (RSS-287), Emergency Position Indicating Radio Beacons (EPIRB), Emergency Locator Transmitters (ELT), Personal Locator Beacons (PLB), and Maritime Survivor Locator Devices (MSLD), Innovation, Science and Economic Development Canada (ISED), a recommendation by the NSS is a requirement of the certification process. A 406 MHz PLB designed and manufactured to the standards contained in this document meets the PLB requirements developed and implemented by the Cospas-Sarsat[2] Partners (Canada, France, the Russian Federation, and the United States), as well as the environmental and documentation requirements considered necessary for PLB use in Canada.

1.2 System overview

Begun as a joint effort of Canada, France, the United States, and Russia in 1979, Cospas-Sarsat is an international system that uses Low-Earth Orbiting Search and Rescue (LEOSAR) satellites; Geostationary Orbiting Search and Rescue (GEOSAR) Satellites; and Medium-Altitude Earth Orbiting Search and Rescue (MEOSAR) Satellites to assist in detecting and locating activated 406 MHz satellite beacons. Canada contributes Search and Rescue Repeaters (SARRs) which receive and retransmit 406 MHz signals anytime a satellite is in view of a ground station. These payloads, along with the Search and Rescue Processors (SARPs) provided by France, are carried aboard environmental satellites provided by the United States. 406 MHz repeater payloads are now also being deployed on Global Navigation Satellite Systems (GNSS) such as Galileo,

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[1] In Canada PLBs must be Certified by Innovation, Science and Economic Development Canada (ISED). One of the many requirements to obtain certification, is to meet the specifications of the most recent issue of this document (NSS-PLB), and receive a recommendation letter from the National Search and Rescue Secretariat, Public Safety Canada, as outlined in RSS-287 and identified in 1.6 of this document.

[2] COSPAS - Cosmicheskaya Sistyema Poiska Avariynych Sudov (Space System for Search of Distressed Vessels) (Russian Federation). SARSAT - Search and Rescue Satellite-Aided Tracking (Canada, France, and United States).

Glonass and GPS in medium-altitude earth orbits. The COSPAS, SARSAT and GNSS Systems are fully interoperable.

Satellite receiver/processors receive distress signals from PLBs transmitting in the 406.0 – 406.1 MHz frequency band. The use of the band is limited by the International Telecommunications Union (ITU) Radio Regulations, Article 5 (Table of Allocations) to low-power satellite EPIRBs[3], which include those that are being used with the COSPAS and SARSAT satellite receiver/processors. The Cospas-Sarsat 406 MHz PLB signal consists of a transmission of unmodulated carrier signal followed by a digital message format that provides identification data, nationality, and (optionally) encoded position data.

Because many search and rescue forces are currently not equipped to home on the 406 MHz PLB signal, homing must be accomplished using another frequency. This document provides for the mandatory inclusion of an auxiliary radio-locating device operating at 121.5 MHz[4] and an optional Automatic Identification System (AIS) transmitter operating in the maritime VHF frequency band.

Local User Terminals (LUTs) process the 406 MHz signal and determine the location of the PLB; the LUT then relays the position of the distress to a Mission Control Center (MCC), specifically the Canadian Mission Control Center (CMCC), located at CFB Trenton when detected in Canada. The distress alert and location information is then immediately forwarded to the closest Canadian Joint-Rescue Center (JRCC), and if necessary Marine Rescue Sub-Center (MRSC), who are responsible for coordinating the Search and Rescue (SAR) response to air and marine incidents within their respective Search and Rescue Regions (SRR). In Canada, we have CMCC/JRCC CFB Trenton, JRCC Halifax, JRCC Victoria, MRSC St. John's and the MRSC Québec

1.3 Purpose and Intended Use

PLBs are intended to provide individuals in remote areas with a means to alert the authorities of an emergency situation requiring immediate assistance. The purpose of the PLB is to both notify and guide search and rescue personnel to the location of individuals in need, by way of the transmitting beacon. The PLB consists of a transmitter, an internal GPS/GNSS receiver and a battery power source, all contained in an impact resistant

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[3] An emergency position-indicating radiobeacon (EPIRB) is defined by the ITU Radio Regulation No. 1.93 as a station in the mobile service the emissions of which are intended to facilitate search and rescue (SAR) operations. A satellite EPIRB is also defined by the ITU Radio Regulations No. 1.94 as an earth station in the mobile-satellite service the emissions of which are intended to facilitate SAR operations.

[4] RSS-287 provides for a mandatory 121.5MHz homer.

watertight case. PLBs are envisioned to be used in two general environments, areas with water (e.g. rivers, lakes, oceans, seas, flooding) and areas without significant water (e.g. deserts, mountains). Therefore, this document includes two categories of PLBs, Category 1 which must float and Category 2 which is not required to float.

1.4 Types of Personal Locator Beacons (PLBs)

406 MHz PLBs are divided into two generations, two categories, three classes and three groups as defined below.

1.4.1 Generations

There are two generations of 406 MHz PLBs.

- First Generation Beacons (FGBs) and
- Second Generation Beacons (SGBs) – Under development but not yet approved for use in Canada.

This document addresses First Generation Beacons (FGBs) that are designed to comply with the Specification for Cospas-Sarsat 406 MHz Distress Beacons, C/S T.001 and are tested and approved to the Cospas-Sarsat 406 MHz Distress Beacon Type Approval Standard, C/S T.007.

1.4.2 Categories

There are two categories of PLBs:

- Category 1 PLBs are designed for use in and around water (but in some circumstances can also be used on land) and must float[5]: and
- Category 2 PLBs are designed principally for use on land (but in some circumstances can also be used in and around water) and are not required to float.

1.4.3 Classes

There are three classes of PLBs:

- Class 0 PLBs are designed for use in extreme climatic conditions and must operate over a temperature range of -55°C to + 70 C;

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[5] Floating can be achieved by either inherent buoyancy or by a permanently attached flotation device (i.e. cannot be disconnected without the use of tools). A flotation aid such as a pouch, bag or floating key fob does not count unless it is permanently attached to the PLB. Category 1 PLBs can either be designed to operate while floating in water or when attached to items of personal LSA, further details are provided in RTCM 11010.3, A.1.10

- Class 1 PLBs are designed for use in arduous climatic conditions and must operate over a temperature range of -40°C to + 55 C; and
- Class 2 PLBs are designed for use in less arduous climatic conditions and must operate over a temperature range of -20°C to + 55°C.

1.4.4 Groups

There are three groups of PLBs:

- Group 1 PLBs include a 121.5 MHz homing transmitter
- Group 2 PLBs – not in use at this time
- Group 3 PLBs include a 121.5 MHz homing transmitter and an AIS transmitter

1.4.5 GNSS Navigation Devices

In Canada, GNSS is only required for Return Link Service (RLS) enabled PLBs, however all types of PLBs designed to include beacon position data, obtained from a GNSS navigation device internal to the PLB shall comply with the applicable requirements in section 1.5.

1.5 Applicable Specifications, Standards, Regulations and Reference Documents

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies;

1.5.1 Innovation, Science and Economic Development Canada

i.   Standards Specification (RSS) 287, [Emergency Position Indicating Radio Beacons, Emergency Locator Transmitters, Personal Locator Beacons and Maritime Survivor Locator Devices (MSLD)];

ii.   RSS-Gen, General Requirements for Compliance of Radio Apparatus;

iii.   Radio Standards Procedure (RSP) 100, "Certification of Radio Apparatus and Broadcasting Equipment";

iv.   Telecommunications Regulation Circular (TRC) 49: "Telecommunications and Radio Equipment Service Fees of the Certification and Engineering Bureau". The current versions of these documents are available on the Innovation, Science and Economic Development Canada website;[6]

v.   RSS-182 — Maritime Radio Equipment Operating in the 156-162.5 MHz Band (AIS enabled PLB's);

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[6] www.ic.gc.ca

vi.   Canada's *Consumer Packaging and Labelling Act*.

1.5.2 Cospas-Sarsat Program Documents

i.   Specification for Cospas-Sarsat 406 MHz Distress Beacons, C/S, T.001;
ii.   Cospas-Sarsat 406 MHz Distress Beacon Type Approval Standard T.007;
iii.   Handbook of Beacon Regulations C/S S.007 CAN;
iv.   Cospas-Sarsat Acceptance of 406 MHz Beacon Type Approval Test Facilities C/S T.008.

1.5.3 Reference Documents

i.   National Search and Rescue Secretariat (NSS) Performance Document 406MHz Personal Locator Beacon (PLB), NSS-PLB, Issue 7, dated April 2022;
ii.   Radio Technical Commission for Maritime Services (RTCM) Standard, RTCM 11010.3, for 406 MHZ Satellite Personal Locator Beacons (PLBs), and all its annexes, published June 25, 2018.

1.6 Technical Acceptance Certification

PLBs shall comply with the standards set forth in this document at 1.5.1 and 1.5.2 and 1.5.3 and as required by Innovation, Science and Economic Development Canada (ISED). Information regarding the ISED type approval process can be obtained on the web site or at the following address:

Certification and Engineering Bureau[7]
Innovation, Science and Economic Development Canada
3701 Carling Avenue (Building 94)
P.O. Box 11490, Station H
Ottawa, Ontario K2H 8S2

Contact the certification bureau for all certification related questions.[8]

Contact the radio standards for all standard related questions. [9]

General contact information for Innovation, Science and Economic Development Canada.[10]

Telephone (Ottawa): 613-990-4218 / Facsimile: 613-990-4752

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[7] https://www.ic.gc.ca/eic/site/ceb-bhst.nsf/eng/home
[8] certificationbureau-bureauhomologation@ised-isde.gc.ca
[9] consultationradiostandards-consultationnormesradio@ised-isde.gc.ca
[10] https://www.ic.gc.ca/eic/site/icgc.nsf/eng/h_07026.html#250

1.7 Interpretation of this Document

If there is variation between this document and the documents described in paragraphs 1.5, the more stringent specification shall apply.

2.0 Design Characteristics

2.1 Cospas-Sarsat Type Approval Requirements

To ensure PLB compatibility with Cospas-Sarsat receiving and processing equipment, PLBs shall meet all requirements specified in the documents identified in paragraph 1.5.2. and;

The coding for PLBs shall be Serial User Protocol, using the Cospas-Sarsat type approval certificate number as specified in C/S T.001 and C/S S.007 CAN for PLBs with no encoded position data. For Location Protocol PLBs, the coding shall be RLS Location Protocol for PLBs with Return Link Service (RLS) –Type 1 Acknowledge, or Standard Location Protocol for all other Location Protocol PLBs as specified in C/S T.001 and C/S S.007 CAN and use the Cospas-Sarsat type approval certificate number.

2.2 Innovation, Science and Economic Development (ISED) Radio Standards Requirements

PLBs must comply with all the requirements specified in the documents identified in paragraph 1.5.1, 1.5.2 and any other standards deemed applicable by ISED.

2.3 National Search and Rescue Secretariat (NSS) Document Requirements

PLBs must comply with all the requirements specified in the documents identified in paragraphs 1.5.2, and 1.5.3 where applicable[11][12].

2.3.1. Labelling

The label shall comply with ISED requirements of RSS 287 and the *Consumer Packaging and Labelling Act*, Cospas-Sarsat System document C/S T.001 and RTCM 11010.3, Section 4.5, as it applies to Canada.

The following warning text shall satisfy the warning label requirements as specified in RTCM 11010.3, section 4.5, part (c):

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[11] www.ic.gc.ca

[12] See paragraph 1.4.5 of this document for requirements related to GNSS, and paragraph 2.3.1 for those pertaining to labeling.

Do Not Move If Found, Report To Police

Ne pas déplacer si trouvé, signaler à la police

In the event that labelling requirements cannot be met because of the size of the PLB, the NSS may alter certain requirements on request from the manufacturer.

2.3.2 Required Documentation

The documentation shall comply with ISED requirements of RSS 287 and the *Consumer Packaging and Labelling Act*, Cospas-Sarsat System document C/S T.001 and RTCM 11010.3, Section 4.5, as it applies to Canada.

Should ISED issue a Technical Acceptance Certificate for the PLB to the applicant, the latter shall also provide:

i.   A uniquely imprinted user registration form, double sided in French and English, available at https://www.cbr-rcb.ca/cbr/ from the Canadian Beacon Registry (CBR), with a right justified hexa-decimal representation of bits 26 to 85 of the beacon digital message coding, to accompany each PLB at the point of sale;

ii.   Prepaid self-addressed envelopes to be used by the purchaser for the transmittal of each registration form shall be provided to the successful applicant by the Canadian Beacon Registry (CBR). for inclusion with each beacon;

iii. An operation manual, detailing the proper use and maintenance of the PLB, for inclusion with each beacon.

3.0 Test Requirements

3.1 Cospas-Sarsat Requirements

The Cospas-Sarsat technical specifications detailed in C/S T.001 shall be verified in accordance with the type approval standards in C/S T.007 by an accepted test facility in accordance with C/S T.008.

3.2 Innovation, Science and Economic Development (ISED) Requirements

The ISED requirements for Technical Acceptance are detailed in documents RSS-182 and RSS 287. All applicable tests are to be performed and the results approved by ISED.

3.3 National Search and Rescue Secretariat (NSS) Document Requirements

All tests for PLBs shall be carried out by a Cospas-Sarsat accredited test facility accepted by the National Search and Rescue Secretariat (NSS), Public Safety Canada, and shall

be tested in accordance with the documents identified in paragraph 1.5.2, and 1.5.3. All applicable tests are to be performed and passed.

4.0 Quality Control

4.1 General

The PLB may be inactive for long periods of time while being exposed to adverse environmental conditions and yet must function properly when activated. The choice of materials used and the manufacturing process are key elements in ensuring its durability, and safety for Canadians.

Failure to meet appropriate standards could result in a recommendation to ISED to review the Technical Acceptance Certificate. If the PLB does not meet the required specifications, ISED may, in consultation with the NSS, declare that the device's Technical Acceptance Certificate be null and void and require that beacons in service be recalled, action be taken to correct the areas of non-compliance and the beacon be retested to have certification reinstated.

The Technical Acceptance Certification holder shall notify ISED and the NSS immediately of proposed modifications made to the PLB. Full technical details shall be submitted so that any type approval retesting requirements can be identified.

List of Acronyms

AIS	Automatic Identification System
C/S	Cospas-Sarsat
CAN	Canada
CBR	Canadian Beacon Registry
CFB	Canadian Forces Base
CMCC	Canadian Mission Control
COSPAS	Cosmicheskaya Sistyema Poiska Avariynych Sudov (Russian Federation)
ELT	Emergency Locator Transmitter (Aircraft)
EPIRB	Emergency Positioning Radio Beacon (Marine vessel)
FBG	First Generation Beacon
GEOSAR	Geostationary Orbiting Search and Rescue
GLONASS	Global Navigation Satellite System (Russian Federation)
GNSS	Global Navigation Satellite System (International Multi-Constellation)
GPS	Global Positioning System (North American)
ISED	Department of Innovation, Science and Economic Development Canada
ITU	International Telecommunications Union
JRCC	Canadian Joint-Rescue Centre
LEOSAR	Low-Earth Orbiting Search and Rescue
LRA	Letter of Recommendation for Approval
LUT	Local User Terminal
MCC	Mission Control Centre
MEOSAR	Medium-Earth Orbiting Search and Rescue
MHz	Megahertz
MRSC	Marine Rescue Sub-Centre
MSLD	Maritime Survivor Locator Device
NSS	National Search and Rescue Secretariat, Public Safety Canada
PLB	Personal Locator Beacon
RLS	Return Link Service
RSP	Radio Standards Procedure
RSS	Radio Standards Specification
RTCM	Radio Technical Commission for Maritime Services
SAR	Search and Rescue
SARP	Search and Rescue Processor
SARR	Search and Rescue Repeater
SARSAT	Search and Rescue Satellite-Aided Tracking (Canada, France, and United States)
SGB	Second Generation Beacon
SRR	Search and Rescue Region
TRC	Telecommunications Regulation Circular