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RSS-287
Issue 1
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Spectrum Management and Telecommunications

Radio Standards Specification

Emergency Position Indicating Radio Beacons (EPIRB), Emergency Locator Transmitters (ELT), Personal Locator Beacons (PLB), and Maritime Survivor Locator Devices (MSLD)

Preface

This first issue of RSS-287 replaces Issue 3, Revision 2 of RSS-187, dated March 25, 2000. With this new issue, RSS-187 is being renumbered as RSS-287. This is being done in accordance with the convention adopted by Industry Canada by which Radio Standards Specifications covering equipment subject to both certification and licensing form the 100 series, those covering equipment subject to certification but exempt from licensing form the 200 series and those covering equipment exempt from both certification and licensing form the 300 series. This new issue will be in force as of the publication date of notice SMSE-003-07, in the *Canada Gazette*, Part I. Upon publication, the public has 90 days to make comments. These comments will be taken into account in the preparation of the next version of the document.

In addition to the changes listed below, Issue 1 of RSS-287 differs from previous issues of the former RSS-187 in that information and requirements generally applicable to most equipment covered under the Radio Standards Specifications has been removed and placed in a new Radio Standards Specification called RSS-Gen. RSS-Gen contains information and requirements common to all or most Radio Standards Specifications and must be used in conjunction with other Radio Standards Specifications such as RSS-287 for compliance with all applicable equipment requirements.

Changes

The following are the main changes:

1. The addition of technical requirements for Maritime Survivor Locator Devices (MSLDs) for maritime use operating at 121.5 MHz.
2. The certification of Class 2 PLBs is now permitted.
3. The certification of PLBs having homing frequencies at both 121.5 MHz and 243 MHz is now permitted.
4. Additional clarification of specifications (Section 1.2).
5. Updates to reference documents for EPIRBs, ELTs and PLBs (Section 2.4).
6. Transport Canada (Airworthiness) has changed its name to Transport Canada Civil Aviation. It continues to share responsibility with Industry Canada for compliance of ELTs. However, Transport Canada Civil Aviation no longer provides test reports for Transport Canada ELT standards and no longer approves test facilities. Evidence of compliance to Transport Canada's ELT standards is now provided by a letter obtained from Transport Canada Civil Aviation. This standard has been revised to reflect these developments.
7. Organizational changes in Canadian Coast Guard (CCG) (AMTJ) require Transport Canada Marine Safety to be responsible for 406 MHz EPIRBs.

8. Address and contact changes have been updated for the Canadian Government Publishing Centre, Transport Canada (Civil Aviation), International Civil Aviation Organization, and NAV CANADA Area Control Centres (see Annex 1).
9. There was a general reformatting of the document.
10. As noted above, this standard is being renumbered as RSS-287 from RSS-187.

Issued under the authority
of the Minister of Industry

R.W. McCaughern
Director General
Spectrum Engineering Branch

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1. Scope

- 1.1 This document sets out the requirements for four types of radio beacons used as:
- emergency position indicating radio beacons (EPIRBs) for maritime applications;
 - emergency locator transmitters (ELTs) for aviation applications;
 - personal locator beacons (PLBs); and,
 - maritime survivor locator devices (MSLDs) for maritime use.
- 1.2 The requirements in this standard apply to all four types of radio beacons, unless otherwise specified.
- 1.3 EPIRBs are for carriage on ships, ELTs for carriage on aircraft and PLBs are for use by persons who may need to send a distress signal and are intended and designed to provide the standardized capabilities necessary to alert satellites, aircraft and vessels. The 406 MHz beacon is an important component of the international satellite-based search and rescue system known as COSPAS/SARSAT (C/S). Canada is a signatory to the International COSPAS/SARSAT Program Agreement. EPIRBs are also a component of the Global Maritime Distress and Safety System (GMDSS).

MSLDs are devices worn on the person while aboard a vessel, that are intended and designed to provide limited proximity alerting and locating capability. In this context, they are intended and designed to only be effective in close proximity to a vessel, where the device will transmit low-power alerting and homing signals to an appropriate directional receiver on board the vessel to facilitate the distressed user's rescue.

Important Note: As MSLDs DO NOT comply with Transport Canada (TC) and National Search and Rescue Secretariat (NSS) minimum performance standards governing EPIRBs and PLBs, respectively, and are NOT intended or designed to provide the standardized capabilities necessary to alert satellites, aircraft and vessels, they are NOT considered to be EPIRBs or PLBs by Industry Canada, in agreement with the Canadian Coast Guard and the National Search and Rescue Secretariat.

- 1.4 Beacons that have been certified by Industry Canada are licence-exempt, pursuant to subsection 4(1) of the *Radiocommunication Act*.
- 1.5 A Technical Acceptance Certificate (TAC) issued by the Certification and Engineering Bureau of Industry Canada or a certificate issued by a recognized Certification Body (CB) is required, pursuant to subsection 21(1) of the *Radiocommunication Regulations*.

Unless otherwise indicated, radiocommunication equipment is subject to licensing pursuant to subsection 4(1) of the *Radiocommunication Act*.

- 1.6 MSLD use is on a non-interference basis to the COSPAS/SARSAT satellite system.

2. General Information

2.1 EPIRBs

2.1.1 COSPAS/SARSAT

The COSPAS/SARSAT satellite-based system is allocated a band of 406.000 to 406.100 MHz. Future satellites may however permit the use of EPIRBs, ELTs and PLBs in other parts of the allocated band. This standard applies to all channels in the allocated band that the COSPAS/SARSAT system may use.

2.1.1.1 Note: COSPAS-SARSAT has made the decision to terminate 121.5/243 MHz alerting services as of February 1, 2009.

2.1.1.2 Note: EPIRBs on 121.5 MHz may no longer be certified in Canada, and as such these devices may not be sold for use in Canada.

2.2 Emergency Situations

In an emergency situation, the radio beacon is turned on either automatically, such as a water-activated switch in an EPIRB and inertia switch in an ELT, or manually by the user. The 406 MHz radio beacon signal can be picked up by COSPAS/SARSAT satellites, which can also determine the location (geographical coordinates) of the radio beacon. The distress transmission is decoded and the information is routed to search and rescue authorities.

2.3 Transmitter Frequency Configurations

For beacons employing 406 MHz as the primary transmitting frequency, the 121.5 MHz frequency is used to aid in search and rescue operations. ELTs not equipped with the 406 MHz frequency may use 121.5 MHz alone or in conjunction with 243 MHz.

The following transmitter frequency configurations are permitted in Canada:

EPIRB: *Cospas-Sarsat:* 406 MHz primary transmitter and a 121.5 MHz homing transmitter.

ELT: 406 MHz and 121.5 MHz
121.5 MHz and 243.0 MHz
121.5 MHz
406 MHz to augment an existing ELT of the 121.5/243 MHz type.

PLB: 406 MHz; the 121.5 MHz homing frequency may be included.
406 MHz with homing frequencies at both 121.5 MHz and 243 MHz.

MSLD: 121.5 MHz.

2.4 Applicable Standards and Related Documents

The applicable standards listed below shall be complied with in order to obtain equipment certification. These documents can be obtained at the addresses listed in Annex 1.

2.4.1 COSPAS/SARSAT Documents

C/S T.001: *Specification for COSPAS/SARSAT 406 MHz Distress Beacons*

C/S T.007: *COSPAS-SARSAT 406 MHz Distress Beacons Type Approval Standard*

The above documents can be obtained from the National Search and Rescue Secretariat (NSS).

2.4.2 Transport Canada Civil Aviation Documents

Canadian Aviation Regulations Part VI, Section 605.38

Airworthiness Manual (AWM) Chapter 551: *Aircraft Equipment and Installation*, Section 551.104, prescribing the Canadian standards of airworthiness for the design and installation of Emergency Locator Transmitter (ELT) equipment.

2.4.3 Transport Canada (Marine Safety) Documents

International Maritime Organization (IMO) Resolution A.810(19): *Performance standards for float-free satellite emergency position-indicating radio beacons (EPIRBs) Operating on 406 MHz*

International Maritime Organization (IMO) Resolution A.660(16): *Carriage of satellite emergency position indicating radio beacons (EPIRBs)*

International Maritime Organization (IMO) Resolution A.662(16): *Performance standards for float-free release and activation arrangements for emergency radio equipment*

IEC 61097-2 of the International Electrotechnical Commission: *Global maritime distress and safety system (GMDSS) - Part 2: COSPAS-SARSAT EPIRB - Satellite emergency position indicating radio beacon operating on 406 MHz - Operational and performance requirements, methods of testing and required test results*

ETS 300 066 of the European Telecommunications Standards Institute: *Radio Equipment and Systems (RES); Float-free maritime satellite Emergency Position Indicating Radio Beacons (EPIRBs) operating on 406.025 MHz; Technical characteristics and methods of measurement*

2.4.4 National Search and Rescue Secretariat (NSS) Document

NSS-PLB 06: National Search and Rescue Secretariat, *Performance Standard for 406 MHz Personal Locator Beacon (PLB)*

3. Measurement Methods 121.5/243 MHz

3.1 Frequency and Output Power Stabilities

The output power and frequency stability measurements described below shall be carried out at (i.e. just before) the end-of-life battery test that is required by, TC or NSS. Other tests such as the out-of-band emissions test can be carried out at any time.

The test set-up shall be in a proper shielded room (see Section 5.9).

The EUT (Equipment Under Test) shall be operated in accordance with the manufacturer's published operation and instruction manual in its normal mode of operation and on an authorized test frequency. The internal modulation source shall be switched off for the frequency stability measurement. No adjustment of any frequency determining circuit element shall be made during the tests.

The output power and unmodulated carrier frequency shall be measured at the antenna connector and under the conditions specified below. A sufficient stabilization period at each temperature shall be used prior to each frequency measurement:

- (a) at 10 degree intervals of temperatures between the temperatures listed below and at the manufacturer's rated supply voltage, and
- (b) at +20°C temperature and ±15% supply voltage variations.

If an unmodulated carrier is not available, the mean frequency of a modulated carrier can be measured instead, using a frequency counter with gating time set to an appropriately large multiple of symbol periods (gating time depending on required accuracy). Full details on the choice of values shall be included in the test report.

Test Temperature Ranges

EPIRBs and MSLDs: float free: -20° to +55°C
manual activation: -20° to +55°C

ELTs: Category C1: -20° to +55°C
Category C2: -55° to +70°C

PLBs: Class 1: -40° to +55°C
Class 2: -20° to +55°C

Note: Instructions on labelling the devices to show the above temperature range classes/categories are found in Transport Canada documents.

3.2 Output Power (Radiated)

If the 121.5 MHz or 243 MHz transmitter is for a primary beacon of an ELT (i.e. ELT not equipped with a 406 MHz transmitter), then a field strength (radiated power) measurement is mandatory. If the frequency is for homing, power measurement at the antenna connector is permitted in lieu of a radiated measurement, and this can be deferred until Section 5.4.

The transmitter shall be modulated by A3X as described in 5.3(a). The resolution bandwidth of the spectrum analyzer shall be wide enough to include all significant modulation products. The bandwidth used shall be reported.

Measure the field strength using a calibrated open area test site at the ambient temperature. Record the ambient temperature. Section 5.9, "Authorization to Perform Radiation Tests" applies.

Unlike the radiated measurement for the 406 MHz transmitter, the radiated power of a 121.5 or 243 MHz transmitter is required only in the main beam (i.e. antenna pattern is not required).

3.3 Unwanted Emissions

The unwanted emissions shall be measured at room temperature and this temperature shall be recorded. The transmitter is to be modulated with the audio sweep signal. A spectrum analyzer of resistance equal to the impedance specified for the antenna is to be used.

3.4 Modulation Factor and Audio Sweep

The transmitter shall be modulated with A3X as described in 5.3(a) and its output displayed on the oscilloscope.

- (i) Measure and record the peak and trough voltages of the RF envelope of the modulated carrier to determine the modulation factor, which is the ratio of the difference to the sum of the carrier levels at the peaks and troughs of the modulated RF envelope, i.e.:

$$\text{Modulation Factor} = \frac{V_{\text{peak}} - V_{\text{trough}}}{V_{\text{peak}} + V_{\text{trough}}}$$

- (ii) Measure and record the direction of the audio sweep.
- (iii) Measure and record the highest and the lowest audio frequencies of the sweep.
- (iv) Measure and record the audio sweep repetition rate.
- (v) Measure and record the modulation duty cycle (see definition in Section 5.3(f)).

- (vi) Modulate the transmitter with voice and CW (carrier wave) if the beacon is equipped with this feature. Provide a diagram of the modulated signal in the time domain, properly labelled to show the duration of each mode (A3X, A3E, N0N) of modulation.

3.5 Spectrum Characteristics

The spectrum characteristics described in Section 5.3(d) are to be measured.

The transmitter shall be modulated with A3X as described in 5.3(a) and (d).

Set the resolution bandwidth of the spectrum analyzer to 60 Hz for 121.5 MHz transmitters and to 120 Hz for 243 MHz transmitters. If a spectrum analyzer of the correct resolution bandwidth is not available, use a narrower bandwidth and sum the powers over the desired band. Record all measurements.

If the beacon design is such that the type of modulation is changed during transmission (e.g. from A3E to N0N), describe the test and verify that the carrier frequency shift complies with Section 5.3(d).

4. General Standard Specifications

4.1 Approved Test Facilities

- 4.1.1 Tests to show compliance to COSPAS/SARSAT standards (i.e. on the 406 MHz transmitter) shall be carried out by a test facility that has been approved by COSPAS/SARSAT.

Addresses of COSPAS/SARSAT approved test facilities may be obtained from NSS.

- 4.1.2 Battery and reliability tests shall be carried out by a test facility approved by Transport Canada (Marine Safety) or a country to which the SOLAS Convention applies for EPIRBs, and by NSS for PLBs. Addresses of such test facilities are obtainable from these organizations.
- 4.1.3 Tests to show compliance with Industry Canada Radio Standards Specifications can be carried out by any competent and properly equipped test facility, except for the 406 MHz transmitter where Section 4.1.1 applies.

4.2 Equipment Labels

- (a) In addition to the labelling requirements set out in RSS-Gen, ELTs must be labelled to comply with Section 5.3(e) and also with the following or equivalent bilingual statement:

This radio beacon transmits on a frequency reserved for aviation emergencies. It is to be used only by occupants of downed aircraft who are in distress. Cette radiobalise émet sur une fréquence réservée aux urgences aéronautiques. Elle ne doit être utilisée que par les occupants en détresse à bord d'un aéronef accidenté.

- (b) Each radio beacon must also be labelled with its type designator, as listed in Section 4.3.
- (c) Labelling required by Transport Canada (Civil Aviation) for ELTs (see Airworthiness Manual, Section 551.104), by Transport Canada (Marine Safety) for EPIRBs (see document IMO A.810(19)), and by NSS for PLBs (see document NSS-PLB 06) , may be combined with the labelling requirements in RSS-Gen and those given in Section 4.2(a) and (b) and put into a single label.
- (d) The sale packaging and user manual of MSLDs must indicate clearly the following or equivalent bilingual statement:

This radio device is designed to only provide an effective alerting and locating capability in close proximity to a vessel. This radio beacon is NOT an EPIRB. Cette radiobalise est conçue uniquement dans le but de fournir une fonction d'alerte et de localisation efficace à proximité immédiate d'un navire. Cette radiobalise n'est PAS une RLS.

4.3 Type Designator

An appropriate type designator (see list below) will be appended as a suffix to the technical acceptance certification number to indicate the class of the device.

Suffix	Abbreviated Definition
E1	EPIRB, float free
E2	EPIRB manual activation
PL	PLB
A	ELT, automatically ejected
AD	ELT, automatic deployable
F	ELT, Fixed
AF	ELT, automatic fixed
AP	ELT, automatic portable
W	ELT, water activated
S	ELT, survival
X	MSLD

4.4 Exposure of Humans to RF Fields

Before equipment certification is granted, the procedures of RSS-102 must be followed concerning exposure of humans to RF fields.

5. Transmitter and Receiver Standard Specifications

5.1 406 MHz Transmitter Applicable Standards

The testing officer should be familiar with the standards and test procedures as follows:

- COSPAS/SARSAT documents C/S T.001 and C/S T.007;
- Section 5 of this RSS;
- Battery reliability and registration card tests described in the TC (Marine Safety) or NSS document.

Caution: Some electrical tests (e.g. output power and frequency stability) are to be performed at the end-of-life battery test.

It is the responsibility of the equipment certification applicant to arrange for the tests specified in this section to be carried out, and to forward the test report (in duplicate) to:

- Transport Canada (Marine Safety) in the case of EPIRBs; and
- NSS in the case of PLBs.

The test report shall contain the following:

- the signature of the testing and supervising officers;
- the name of the signing persons;
- phone and facsimile numbers;
- full name and address of the testing facility; and
- proof that the facility is an approved test facility.

The battery reliability and registration card test results as well as the electrical/electronic measurements on the 406 MHz transmitter will be evaluated by TC (Marine Safety) or NSS, as appropriate, who will forward a copy of the test report with a recommendation to Industry Canada (Manager, Certification and Market Surveillance) or to the appropriate Recognized Certification Body (CB).

Industry Canada or the appropriate Certification Body will evaluate the 406 MHz transmitter output power, field strength, and frequency stability measurement results. The test results for the homing transmitter will also be evaluated if applicable.

5.2 121.5/243 MHz Applicable Standards

Section 5.1 which applies to the 406 MHz transmitter, also generally apply to the 121.5 MHz and 243 MHz transmitters (except for the reference to the COSPAS/SARSAT documents).

The frequency 121.5 MHz is used as the homing frequency for EPIRBs and MSLDs. This homing frequency is optional for PLBs. PLBs can also be equipped to use both 121.5 MHz and 243 MHz as homing frequencies.

ELTs use either 121.5 MHz or both 121.5 and 243 MHz (with or without the 406 MHz).

5.3 Modulation Characteristics (121.5 MHz or 243 MHz Transmitter)

The modulation technique for each carrier is described as follows:

- (a) The type of emission shall be A3X (described below), with periods of voice modulation or no modulation (CW) permitted as described below.

During A3X transmissions, the emissions shall have the distinctive characteristic achieved by amplitude modulating the carrier with an audio frequency sweeping downwards for ELTs, and upwards or downwards for EPIRBs and upwards for PLBs, over a range of not less than 700 Hz within the band 300 Hz to 1600 Hz, at a sweep repetition rate between 2 and 4 Hz.

- (b) The modulation factor for A3X modulation shall be at least 85% and not more than 100%, i.e. over-modulation is not permitted.
- (c) The transmission shall be continuous except in the case of a homing transmitter when it may be interrupted for up to 2 seconds during the transmission of the 406 MHz burst.
- (d) The A3X modulation must have a clearly defined carrier frequency distinct from the modulation sideband components. For this, at least 30% of the total power emitted during any transmission shall be contained within ± 30 Hz of the carrier frequency in the case of the 121.5 MHz beacon, and ± 60 Hz of the carrier frequency in the case of the 243.0 MHz beacon.

Additionally, if the type of modulation is changed during transmission (e.g. to voice in the case of ELTs), the carrier frequency shall not shift by more than ± 30 Hz and ± 60 Hz for the 121.5 MHz and 243.0 MHz transmitters respectively.

- (e) Voice (A3E) and/or carrier wave (N0N) emissions are permitted but only for ELTs and provided that they are consistent with the device's primary function. However, in the case of synthesized or recorded voice, each message must be accompanied by the words "this is a recording". Furthermore, the transmission of A3E and/or N0N shall not exceed 90 seconds in total without at least 3 minutes of A3X emission. These periods of alternate modulation shall not consume more power than the normal A3X modulation.

The manufacturer shall provide the following or equivalent marking on the external surface of the ELT:

Keep voice transmissions short. Les périodes d'émission en phonie doivent être réduites au minimum.

The modulation technique employed shall be described in the test report/certification application, complete with a diagram showing the duration of each emission type.

- (f) Modulation Duty Cycle: Modulation duty cycle is the ratio of the positive modulation duration, measured at the half-amplitude points on the modulation signal envelope, to the period of the audio modulating frequency. This duty cycle shall be between 33% and 55%.

The modulation duty cycle (or ratio) is not to be confused with the transmission duty cycle described in Section 5.3(e).

5.4 Frequency and Output Power Stability

The RF carrier frequency shall not depart by more than 0.005% (± 50 ppm) from that measured at 20°C and rated supply voltage. If the 121.5 MHz and 243 MHz frequencies are derived from the same oscillator circuitry, it is not necessary to repeat the frequency stability test for the other frequency.

The RF output power shall not fall below the minimum 25 mW for any homer transmitter, or below 50 mW for an ELT primary frequency. Furthermore, in the latter case the antenna conducted power, if measured, should agree (within measurement error) with the power measurement made with the open area test method.

5.5 Output Power (Radiated)

The output power of EPIRBs, ELTs, and PLBs shall **not** be less than 50 mW when the transmitter is used as a primary beacon and not less than 25 mW when used as a homing transmitter. The output power of MSLDs shall be less than 25 mW.

5.6 Unwanted Emissions

The power of unwanted emissions measured by an averaging meter of 300 Hz resolution bandwidth shall be attenuated below the level of the mean transmitter power (TP) by:

- (a) at least 25 dB on any frequency removed from the centre of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth;
- (b) at least 30 dB on any frequency removed from the centre of the authorized bandwidth by more than 100%.

The authorized bandwidth is 25 kHz.

5.7 Modulation Factor and Audio Sweep

The required standards are found in Sections 5.3(a) to (c), (e) and (f).

5.8 Spectrum Characteristics

The narrow band power shall not drop by more than 5 dB below the transmitter mean output power that is measured by a wide band meter (for the latter, see Section 3.2 or 3.1), indicating that at least 30% of the power resides within the band $f_c \pm 30$ Hz (at 121.5 MHz) and within the band $f_c \pm 60$ Hz (at 243 MHz).

5.9 Authorization to Perform Radiation Tests

Before carrying out any tests (at offset or at distress frequencies) that involve radiation of signal into the air (including any tests not performed in a proper shielded room, whether the antenna is attached to the beacon or not), the testing officer shall obtain prior authorization from the offices/agencies (addresses in Annex 1) nearest to where radiation testing is to be conducted, as follows:

- NAV CANADA Area Control Centre (ACC)
- NAV CANADA Air Traffic Control Agencies
- Canadian Mission Control Centre (CMCC) at CFB Trenton, Ontario
- Joint Rescue Coordination Centre (JRCC)

Note: The local NAV CANADA office should be contacted for up-to-date telephone numbers of the above mentioned personnel/agencies. In informing each party, the testing officer shall provide the following information several days in advance: name, telephone number, date and duration of the test (test time shall be as short as possible), and location of the test site.

The agencies' written consent to the test should be submitted to the local Industry Canada office for the purpose of issuing the authorization to use the radio frequency.

Unless there are valid reasons to use distress frequencies (other than 406.025 MHz), only offset frequencies may be authorized as follows:

- 121.100 to 121.450 MHz; 121.550 to 121.900 MHz;
- 242.200 to 242.900 MHz; 243.100 to 243.800 MHz;
- 406.025 MHz (i.e. no offset provided that the beacon test bit pattern is set to "test protocol", see C/S T.007).

Great care shall be taken not to accidentally radiate in the forbidden bands (121.5 MHz \pm 50 kHz and 243 MHz \pm 100 kHz).

5.10 Transport Canada and National Search and Rescue Secretariat Requirements

Section 5.1 specifies the test report evaluation requirements of Transport Canada (Marine Safety) for EPIRBs and of the National Search and Rescue Secretariat for PLBs.

For ELTs, compliance with the ELT standard of Section 551.104 of the Airworthiness Manual must be demonstrated by a letter from Transport Canada Civil Aviation.

Annex 1 - Addresses

The following are addresses relevant to this document. The addresses, especially telephone and fax numbers, are subject to change without notice:

- (1) Canadian Mission Control Centre (CMCC)
P.O. Box 1000, Canadian Forces Base Trenton, 8 Wing
Astra, ON
K0K 3W0
Duty Officer Tel: (613) 965-2026/fax: (613) 965-7045
Tel: (613) 965-3660
Fax: (613) 965-7190

- (2) COSPAS/SARSAT Secretariat
700 de la Gauchetière West
Suite 2450
Montréal, QC
H3B 5M2
Tel: (514) 954-6761

- (3) International Civil Aviation Organization
Document Sales Unit
999 University Street
Montréal, QC
H3C 5H7
Tel: (514) 954-8022
Fax: (514) 954-6769
E-mail: sale@icao.int

- (4) International Maritime Organization
4 Albert Embankment
London, England, SE1 7SR
Tel: (44) 71-735-7611
Fax: (44) 71-587-3210

- (5) International Telecommunication Union
General Secretariat - Sales Service
Place Des Nations
CH -1211 Geneva 20, Switzerland
Fax: (41) 22 730 5194
Telex: 421000 UITCH

(6) National Search and Rescue Secretariat
275 Slater Street, 4th Floor
Ottawa, ON
K1A 0K2
Tel: (613) 992-6667
Fax: (613) 996-3746

(7) Joint Rescue Coordination Centres (JRCCs), East to West:

Joint Rescue Co-ordination Centre Halifax
Canadian Forces Base, Halifax
P.O. Box 99000 Stn Forces
Halifax, NS
B3K 2X0
Tel: (902) 427-2104
Fax: (902) 424-2114

Joint Rescue Co-ordination Centre
Trenton
Canadian Forces Base, Trenton
P.O. Box 810
Trenton, ON
K8V 5W6
Tel: (613) 392-2811 ext 3875
Fax: (613) 965-7190

Joint Rescue Co-ordination Centre Victoria
Canadian Forces Base, Esquimalt
P.O. Box 17000 Stn Forces
Victoria, BC
V0F 1B0
Tel: (604) 363-2988
Fax: (604) 363-2944

(8) Transport Canada Civil Aviation
Attention: Manager, Avionics and
Electrical Systems Engineering (AARDD/A)
Place de Ville, Tower "C"
330 Sparks Street
Ottawa, ON
K1A 0N8
Tel: (613) 952-4328
Fax: (613) 996-9178

(9) Transport Canada (Marine Safety)
Place de Ville, 10th Floor
330 Sparks Street
Ottawa, ON
K1A 0N5
Tel: (613) 991-3134
Fax: (613) 993-8196
E-mail: marinesafety@tc.gc.ca

(10) NAV CANADA Air Traffic Control Agencies, East to West:

Eastern Regional Director
1601 Tom Roberts Avenue, U53
Gloucester, ON
K1V 1E5
Tel: (613) 248-4070
Fax: (613) 248-4061

Western Regional Director
300-9925 109 Street, Suite 300
Edmonton, AB
T5K 2J8
Tel: (780) 413-5303
Fax: (780) 413-5304

(11) NAV CANADA Area Control Centre (ACC), East to West:

Gander Area Control Centre
ANS Building
2C Memorial Drive
P.O. Box 328
Gander, NL
A1V 1W7
Tel: (709) 651-5230
Fax: (709) 651-5235

Ottawa Terminal Control Unit
1601 Tom Roberts Avenue
P.O. Box 9824 Stn. T
Gloucester, ON
K1G 6R2
Tel: (613) 248-3818
Fax: (613) 248-3823

Moncton Area Control Centre
222 Old Coach Road
Riverview, NB
E1B 4G2
Tel: (506) 851-7150
Fax: (506) 851-7170

Winnipeg Area Control
777 Moray Street
Winnipeg, MB
R3J 3W8
Tel: (204) 983-8566
Fax: (204) 983-8347

Montréal Area Control Centre
1750 Chemin St-François
Dorval, QC
H9P 2P6
Tel: (514) 633-2870
Fax: (514) 633-2881

Edmonton Area Control Centre
P.O. Box 9867
Edmonton, AB
T5J 2T2
Tel: (403) 890-8322
Fax: (403) 890-8451

Toronto Area Control Centre
6055 Midfield Rd.
Mississauga, ON
L4W 2P7
Tel: (905) 676-4561
Fax: (905) 676-4654

Vancouver Area Control Centre
4611 Cowley Crescent
Richmond, BC
V7B 1B9
Tel: (604) 775-9613
Fax: (604) 775-9657