Republic of the Philippines
Department of Transportation and Communications
CIVIL AVIATION AUTHORITY OF THE PHILIPPINES
Office of the Director General

MEMORANDUM CIRCULAR NO.: 16-15

TO : **ALL CONCERNED**

FROM : **THE DIRECTOR GENERAL**

SUBJECT : **AMENDMENT TO PHILIPPINE CIVIL AVIATION REGULATIONS – AIR NAVIGATION SERVICES (CAR-ANS) PART 8 INCORPORATING ADDITIONAL ANNEX 10 VOLUME 3 Part II SARPs**

REFERENCE:

1. Philippine Civil Aviation Regulations- Air Navigation Services Part 8
2. ICAO Annex 10 Volume III Part II
3. Regulations Amendment Procedures
4. Board Resolution No. 2012-054 dated 28 September 2012

Pursuant to the powers vested in me under the Republic Act 9497, otherwise known as the Civil Aviation Authority Act of 2008 and in accordance with the Board Resolution No.: 2012-054 dated 28 September 2012, I hereby approve the incorporation of additional ICAO Annex 10 Volume III Part II Standards and Recommended Practices to the Philippine Civil Aviation Regulations – Air Navigation Services.

ORIGINAL REGULATION:

CAR-ANS PART 8

MANUAL OF STANDARDS FOR VOICE COMMUNICATION SYSTEMS

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INTRODUCTION

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ICAO Annex 10 standards and recommended practices (SARPS) are contained in the MOS. Standards are applicable to all communication, navigation and surveillance facilities used in support of international air navigation.

This CAR-ANS is referenced in CAR-ANS Part 10, Civil Aviation Regulations governing CNS services. Users of this document should refer to the applicable provision of CAR-ANS, together with this manual, to ascertain the requirements of, and the obligations imposed by, the civil aviation legislation in regard to air navigation service.

The responsibility of matters within this Manual of Standards is with the Aerodrome and Air Navigation Services Safety Oversight Office, CAAP.

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(NOTE: The current version of CAR-ANS 8 does not contain a section on DEFINITIONS.)

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8.2 AERONAUTICAL MOBILE SERVICE

8.2.1 AIR-GROUND VHF COMMUNICATION SYSTEM CHARACTERISTICS

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8.2.1.1.3 The radio frequencies used shall be selected from the radio frequencies in the band 117.975 - 137 MHz. The separation between assignable frequencies (channel spacing) and frequency tolerances applicable to elements of the system shall be as specified in Volume V.

8.2.2 SYSTEM CHARACTERISTICS OF THE GROUND INSTALLATION

8.2.2.1 Transmitting function

8.2.2.1.1 *Frequency stability.* The radio frequency of operation shall not vary more than plus or minus 0.005 per cent from the assigned frequency. Where 25 kHz channel spacing is introduced in accordance with Volume V, the radio frequency of operation shall not vary more than plus or minus 0.002 per cent from the assigned frequency. Where 8.33 kHz channel spacing is introduced in accordance with Volume V, the radio frequency of operation shall not vary more than plus or minus 0.0001 per cent from the assigned frequency.

Note — The above tolerances will not be suitable for offset carrier systems.

8.2.2.1.1.1 Offset carrier systems in 25 kHz, 50 kHz and 100 kHz channel spaced environments. The stability of individual carriers of an offset carrier system shall be such as to prevent first-order heterodyne frequencies of less than 4 kHz and, additionally, the maximum frequency excursion of the outer carrier frequencies from the assigned carrier frequency shall not exceed 8 kHz. Offset carrier systems shall not be used on 8.33 kHz spaced channels.

Note — Examples of the required stability of the individual carriers of offset carrier systems may be found at the attachment to Part II.

8.2.2.1.2 POWER

Recommendation - On a high percentage of occasions, the effective radiated power should be such as to provide a field strength of at least 75 microvolts per metre (minus 109 dBW/m^2) within the defined operational coverage of the facility, on the basis of free-space propagation.

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8.2.2.1.4 Recommendation - Means should be provided to maintain the average modulation factor at the highest practicable value without overmodulation.

8.2.2.2 Receiving function

8.2.2.2.1 *Frequency stability.* Where 8.33 kHz channel spacing is introduced in accordance with Volume V, the radio frequency of operation shall not vary more than plus or minus 0.0001 per cent from the assigned frequency.

. . .

8.2.2.2.3 *Effective acceptance bandwidth.* When tuned to a channel having a width of 25 kHz, 50 kHz or 100 kHz, the receiving system shall provide an adequate and intelligible audio output when the signal specified at 2.2.2.2 has a carrier frequency within plus or minus 0.005 per cent of the assigned frequency. When tuned to a channel having a width of 8.33 kHz, the receiving system shall provide an adequate and intelligible audio output when the signal specified at 2.2.2.2 has a carrier frequency within plus or minus 0.0005 per cent of the assigned frequency. Further information on the effective acceptance bandwidth is contained in the Attachment A to Part II.

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8.2.2.2.4 *Adjacent channel rejection.* The receiving system shall ensure an effective rejection of 60 dB or more at the next assignable channel.

Note — The next assignable frequency will normally be plus or minus 50 kHz. Where this channel spacing will not suffice, the next assignable frequency will be plus or minus 25 kHz, or plus or minus 8.33 kHz, implemented in accordance with the provisions of Volume V. It is recognized that in certain areas of the world receivers designed for 25 kHz, 50 kHz or 100 kHz channel spacing may continue to be used.

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8.2.3.1.5 Recommendation - Means should be provided to maintain the average modulation factor at the highest practicable value without overmodulation.

. . .

8.2.3.2 Receiving function

8.2.3.2.1 *Frequency stability.* Where 8.33 kHz channel spacing is introduced in accordance with Volume V, the radio frequency of operation shall not vary more than plus or minus 0.0005 per cent from the assigned frequency.

8.2.3.2.2 SENSITIVITY

8.2.3.2.2.1 Recommendation - After due allowance has been made for aircraft feeder mismatch, attenuation loss and antenna polar diagram variation, the sensitivity of the receiving function shall be such as to provide on a high percentage of occasions an audio output signal with a wanted/unwanted ratio of 15 dB, with a 50 per cent amplitude modulated (A3E) radio signal having a field strength of 75 microvolts per metre (minus 109 dBW/m^2).

. . .

8.2.3.2.3 *Effective acceptance bandwidth for 100 kHz, 50 kHz and 25 kHz channel spacing receiving installations.* When tuned to a channel designated in Volume V as having a width of 25 kHz, 50 kHz or 100 kHz, the receiving function shall ensure an effective acceptance bandwidth as follows:

a) in areas where offset carrier systems are employed, the receiving function shall provide an adequate audio output when the signal specified at 2.3.2.2 has a carrier frequency within 8 kHz of the assigned frequency;

b) in areas where offset carrier systems are not employed, the receiving function shall provide an adequate audio output when the signal specified at 2.3.2.2 has a carrier frequency of plus or minus 0.005 per cent of the assigned frequency.

8.2.3.2.4 *Effective acceptance bandwidth for 8.33 kHz channel spacing receiving installations.* When tuned to a channel designated in Volume V, as having a width of 8.33 kHz, the receiving function shall provide an adequate audio output when the signal specified in 2.3.2.2 above has a carrier frequency within plus or minus 0.0005 per cent of the assigned frequency. Further information on the effective acceptance bandwidth is contained in Attachment A to Part II.

Note 1 — The effective acceptance bandwidth includes Doppler shift.

8.2.3.2.5 *Adjacent channel rejection.* The receiving function shall ensure an effective adjacent channel rejection as follows:

a) *8.33 kHz channels*: 60 dB or more at plus or minus 8.33 kHz with respect to the assigned frequency, and 40 dB or more at plus or minus 6.5 kHz;

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8.2.3.2.6 Recommendation - Whenever practicable, the receiving system should ensure an effective adjacent channel rejection characteristic of 60 dB or more at plus or minus 25 kHz, 50 kHz and 100 kHz from the assigned frequency for receiving systems intended to operate in channel spacing environments of 25 kHz, 50 kHz and 100 kHz respectively.

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8.2.3.2.7 Recommendation - In the case of receivers complying with 2.3.2.3 above used in areas where offset carrier systems are in force, the characteristics of the receiver should be such that:

. . .

8.2.3.2.8.1 For equipment intended to be used in independent operations of services applying DSB-AM and VDL technology on board the same aircraft, the receiving function shall provide an adequate and intelligible audio output with a desired signal field strength of not more than 150 microvolts per metre (minus 102 dBW/m^2) and with an undesired VDL signal field strength of at least 50 dB above the desired field strength on any assignable channel 100 kHz or more away from the assigned channel of the desired signal.

Note — This level of VDL interference immunity performance provides a receiver performance consistent with the influence of the VDL RF spectrum mask as specified in Volume III, Part I, 6.3.4 with an effective transmitter/receiver isolation of 68 dB. Better transmitter and receiver performance could result in less isolation required.

8.2.3.2.8.2 After 1 January 2002, the receiving function of all new installations intended to be used in independent operations of services applying DSB-AM and VDL technology on board the same aircraft shall meet the provisions of 2.3.2.8.1.

8.2.3.2.8.3 After 1 January 2005, the receiving function of all installations intended to be used in independent operations of services applying DSB-AM and VDL technology on board the same aircraft shall meet the provisions of 2.3.2.8.1, subject to the conditions of 2.3.2.8.4.

8.2.3.2.8.4 Requirements for mandatory compliance of the provisions of 2.3.2.8.3 shall be made on the basis of regional air navigation agreements which specify the airspace of operation and the implementation timescales.

8.2.3.2.8.4.1 The agreement indicated in 2.3.2.8.4 shall provide at least two years' notice of mandatory compliance of airborne systems.

8.2.3.3 Interference immunity performance

8.2.3.3.1 After 1 January 1998, the VHF communications receiving system shall provide satisfactory performance in the presence of two signal, third-order intermodulation products caused by VHF FM broadcast signals having levels at the receiver input of minus 5 dBm.

8.2.3.3.2 After 1 January 1998, the VHF communications receiving system shall not be desensitized in the presence of VHF FM broadcast signals having levels at the receiver input of minus 5 dBm.

Note — Guidance material on immunity criteria to be used for the performance quoted in 2.3.3.1 and 2.3.3.2 is contained in the Attachment to Part II 1.3.

8.2.3.3.3 After 1 January 1995, all new installations of airborne VHF communications receiving systems shall meet the provisions of 2.3.3.1 and 2.3.3.2.

8.2.3.3.4 Recommendation - Airborne VHF communications receiving systems meeting the immunity performance Standards of 2.3.3.1 and 2.3.3.2 should be placed into operation at the earliest possible date.

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8.2.4.1.1 FREQUENCY RANGE

8.2.4.1.1.1 HF SSB installations shall be capable of operation at any SSB carrier (reference) frequency available to the Aeronautical Mobile (R) Service in the band 2.8 MHz to 22 MHz and necessary to meet the approved assignment plan for the region(s) in which the system is intended to operate, and in compliance with the relevant provisions of the Radio Regulations.

*Note 1 — See Introduction to CAR-ANS Part 13.3, and Figures 2-1 and 2-2.**

Note 2 — The ITU World Administrative Radio Conference, Aeronautical Mobile (R) Service, Geneva, 1978, established a new Allotment Plan (Appendix 27, Aer to the Radio Regulations) based on single sideband replacing the earlier double sideband Allotment Plan. The World Radio communication Conference 1997.

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8.2.4.1.4.1 The system shall utilize the suppressed carrier class of emission J3E (also J7B and J9B as applicable). When SELCAL is employed as specified in 8.3 of CAR-ANS, the installation shall utilize class H2B emission.

8.2.4.1.4.2 By 1 February 1982 aeronautical stations and aircraft stations shall have introduced the appropriate class(es) of emission prescribed in 2.4.1.4.1 above. Effective this date the use of class A3E emission shall be discontinued except as provided in 2.4.1.4.4 below.

8.2.4.1.4.3 Until 1 February 1982 aeronautical stations and aircraft stations equipped for single sideband operations shall also be equipped to transmit class H3E emission where required to be compatible with reception by double sideband equipment. Effective this date the use of class H3E emission shall be discontinued except as provided in 2.4.1.4.4 below.

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8.2.4.1.5.1 For radiotelephone emissions the audio frequencies shall be limited to between 300 and 2 700 Hz and the occupied bandwidth of other authorized emissions shall not exceed the upper limit of J3E emissions. In specifying these limits, however, no restriction in their extension shall be implied in so far as emissions other than J3E are concerned, provided that the limits of unwanted emissions are met (see 2.4.1.7).

. . .

8.2.4.1.6.2 The basic frequency stability of the receiving function shall be such that, with the transmitting function stabilities specified in 2.4.1.6.1, the overall frequency difference between ground and airborne functions achieved in service and including Doppler shift, does not exceed 45 Hz. However, a greater frequency difference shall be permitted in the case of supersonic aircraft.

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8.2.4.1.7.2 For aircraft station transmitters first installed after 1 February 1983 and for aeronautical station transmitters in use as of 1 February 1983 and using single sideband classes of emission H2B, H3E, J3E, J7B or J9B, the peak envelope power (P_p) of any emission on any discrete frequency shall be less than the peak envelope power (P_p) of the transmitter in accordance with the following:

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— on any frequency removed from the assigned frequency by 7.5 kHz or more:

a) aircraft station transmitters: 43 dB;

b) aeronautical station transmitters: for transmitter power up to and including 50 W:

$$[43 + 10 \log 10 Pp\ (W)]\ dB$$

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For transmitter power more than 50 W: 60 dB.

8.2.4.1.8 POWER

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S27/60 Unless otherwise specified in Part II of this Appendix, the peak envelope powers supplied to the antenna transmission line shall not exceed the maximum values indicated in the table below; the corresponding peak effective radiated powers being assumed to be equal to two-thirds of these values:

(See Annex for data)

8.3 SELCAL SYSTEM

8.3.1 Recommendation - *Where a SELCAL system is installed, the following system characteristics should be applied:*

. . .

e) *Transmitted tones*. Tone codes should be made up of various combinations of the tones listed in the following table and designated by color and letter as indicated:

Designation	*Frequency (Hz)*
Red A	*312.6*
Red B	*346.7*
Red C	*384.6*
Red D	*426.6*
Red E	*473.2*
Red F	*524.8*
Red G	*582.1*
Red H	*645.7*
Red J	*716.1*
Red K	*794.3*
Red L	*881.0*
Red M	*977.2*
Red P	*1 083.9*
Red Q	*1 202.3*
Red R	*1 333.5*
Red S	*1 479.1*

8.3.2 As from 1 September 1985, aeronautical stations which are required to communicate with SELCAL-equipped aircraft shall have SELCAL encoders in accordance with the red group in the table of tone frequencies of 3.1. After 1 September 1985, SELCAL codes using the tones Red P, Red Q, Red R, and Red S may be assigned.

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8.4 AERONAUTICAL SPEECH CIRCUITS

8.4.1 TECHNICAL PROVISIONS RELATING TO INTERNATIONAL AERONAUTICAL SPEECH CIRCUIT SWITCHING AND SIGNALLING FOR GROUND-GROUND APPLICATIONS

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8.4.1.3 Recommendation - The ATC communication requirements defined in Annex 11, Section 6.2 should be met by implementation of one or more of the following basic three call types:

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8.8.4.1.4 Recommendation - In addition to the ability to make basic telephone calls, the following functions should be provided in order to meet the requirements set out in Annex 11:

. . .

8.4.1.5 Recommendation - The characteristics of the circuits used in aeronautical speech circuit switching and signalling should conform to appropriate ISO/IEC international standards and ITU-T recommendations.

8.4.1.6 Recommendation - Digital signalling systems should be used wherever their use can be justified in terms of any of the following:

. . .

8.4.1.7 Recommendation - The characteristics of supervisory tones to be used (such as ringing, busy, number unobtainable) should conform to appropriate ITU-T recommendations.

8.4.1.8 Recommendation - To take advantage of the benefits of interconnecting regional and national aeronautical speech networks, the international aeronautical telephone network numbering scheme should be used.

8.5 EMERGENCY LOCATOR TRANSMITTER (ELT) FOR SEARCH AND RESCUE

8.5.1 GENERAL

8.5.1.1 Until 1 January 2005, emergency locator transmitters shall operate either on both 406 MHz and 121.5 MHz or on 121.5 MHz.

8.5.1.2 All installations of emergency locator transmitters operating on 406 MHz shall meet the provisions of 5.3.

8.5.1.3 All installations of emergency locator transmitters operating on 121.5 MHz shall meet the provisions of 5.2.

8.5.1.4 From 1 January 2005, emergency locator transmitters shall operate on 406 MHz and 121.5 MHz simultaneously.

8.5.1.5 All emergency locator transmitters installed on or after 1 January 2002 shall operate simultaneously on 406 MHz and 121.5 MHz.

8.5.1.6 The technical characteristics for the 406 MHz component of an integrated ELT shall be in accordance with 5.3.

8.5.1.7 The technical characteristics for the 121.5 MHz component of an integrated ELT shall be in accordance with 5.2.

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8.5.1.9 ELT register information shall include the following:

a) transmitter identification (expressed in the form of an alphanumerical code of 15 hexadecimal characters);

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g) colour of the aircraft.

* COSPAS – Space system for search of vessels in distress;

SARSAT – Search and rescue satellite-aided tracking

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8.5.2 SPECIFICATION FOR THE 121.5 MHz COMPONENT OF EMERGENCY LOCATOR TRANSMITTER (ELT) FOR SEARCH AND RESCUE

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8.5.2.1.4 The type of emission shall be A3X. Any other type of modulation that meets the requirements of 5.2.1.5, 5.2.1.6, and 5.2.1.7 may be used provided that it will not prejudice precise location of the beacon by homing equipment.

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8.5.2.1.8 After 1 January 2000, the emission shall include a clearly defined carrier frequency distinct from the modulation sideband components; in particular, at least 30 per cent of the power shall be contained at all times within plus or minus 30 Hz of the carrier frequency on 121.5 MHz.

8.5.3 SPECIFICATION FOR THE 406 MHz COMPONENT OF EMERGENCY LOCATOR TRANSMITTER (ELT) FOR SEARCH AND RESCUE

8.5.3.1 Technical characteristics

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8.5.3.1.1 Emergency locator transmitters shall operate on one of the frequency channels assigned for use in the frequency band 406.0 to 406.1 MHz.

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AMENDED REGULATION:

CAR-ANS PART 8

GOVERNING VOICE COMMUNICATION SYSTEMS

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INTRODUCTION

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ICAO Annex 10 Standards and Recommended Practices (SARPs) are contained in CAR-ANS Part 8. Standards are applicable to all communication, navigation and surveillance facilities used in support of international air navigation.

This CAR-ANS is referenced in CAR-ANS Part 10, Civil Aviation Regulations Governing Regulatory Requirements and Standards for Operation and Maintenance of CNS Services. Users of this document should refer to the applicable provision of CAR-ANS, to ascertain the requirements of, and the obligations imposed by, the civil aviation legislation in regard to air navigation service.

The responsibility of matters within CAR-ANS Part 8, Governing Voice Communication Systems is with the Aerodrome and Air Navigation Services Safety Oversight Office, CAAP.

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8.1 DEFINITIONS

Facility availability. The ratio of actual operating time to specified operating time.

Facility failure. Any unanticipated occurrence which gives rise to an operationally significant period during which a facility does not provide service within the specified tolerances.

Facility reliability. The probability that the ground installation operates within the specified tolerances.

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Note — This definition refers to the probability that the facility will operate for a specified period of time.

Mean time between failures (MTBF). The actual operating time of a facility divided by the total number of failures of the facility during that period of time.

Note — The operating time is in general chosen so as to include at least five, and preferably more, facility failures in order to give a reasonable measure of confidence in the figure derived.

Signal reliability. The probability that a signal-in-space of specified characteristics is available to the aircraft.

Note — This definition refers to the probability that the signal is present for a specified period of time.

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8.2 AERONAUTICAL MOBILE SERVICE

8.2.1 AIR-GROUND VHF COMMUNICATION SYSTEM CHARACTERISTICS

8.2.1 AIR-GROUND VHF COMMUNICATION SYSTEM CHARACTERISTICS

Note — In the following text the channel spacing for 8.33 kHz channel assignments is defined as 25 kHz divided by 3 which is 8.3333 ... kHz.

8.2.1.1.3 The radio frequencies used shall be selected from the radio frequencies in the band 117.975 - 137 MHz. The separation between assignable frequencies (channel spacing) and frequency tolerances applicable to elements of the system shall be as specified in CAR-ANS Part 13.

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8.2.1.1.4 The design polarization of emissions shall be vertical.

8.2.2 SYSTEM CHARACTERISTICS OF THE GROUND INSTALLATION

8.2.2.1 Transmitting function

8.2.2.1.1 *Frequency stability.* The radio frequency of operation shall not vary more than plus or minus 0.005 per cent from the assigned frequency. Where 25 kHz channel spacing is introduced in accordance with CAR-ANS Part 13, the radio frequency of operation shall not vary more than plus or minus 0.002 per cent from the assigned frequency. Where 8.33 kHz channel spacing is introduced in accordance with CAR-ANS Part 13, the radio frequency of operation shall not vary more than plus or minus 0.0001 per cent from the assigned frequency.

Note — The above frequency stability requirements will not be sufficient for offset carrier systems using 25 kHz channel spacing or higher.

8.2.2.1.1.1 Offset carrier systems in 8.33 kHz, 25 kHz, 50 kHz and 100 kHz channel spaced environments. The stability of individual carriers of an offset carrier system shall be such as to prevent first-order heterodyne frequencies of less than 4 kHz and, additionally, the maximum frequency excursion of the outer carrier frequencies from the assigned carrier frequency shall not exceed 8 kHz. Offset carrier systems for 8.33 kHz channel spacing shall be limited to two-carrier systems using a carrier offset of plus and minus 2.5 kHz.

Note — Examples of the required stability of the individual carriers of offset carrier systems may be found at the Attachment to CAR-ANS Part 8: Guidance Material for Communication Systems.

8.2.2.1.2 POWER

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On a high percentage of occasions, the effective radiated power shall be such as to provide a field strength of at least 75 microvolts per metre (minus 109 dBW/m^2) within the defined operational coverage of the facility, on the basis of free-space propagation.

8.2.2.1.3 *Modulation.* A peak modulation factor of at least 0.85 shall be achievable.

8.2.2.1.4 Means shall be provided to maintain the average modulation factor at the highest practicable value without overmodulation.

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8.2.2.2 Receiving function

8.2.2.2.1 *Frequency stability.* Where 8.33 kHz channel spacing is introduced in accordance with CAR-ANS Part 13, the radio frequency of operation shall not vary more than plus or minus 0.0001 per cent from the assigned frequency.

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8.2.2.2.3 *Effective acceptance bandwidth.* When tuned to a channel having a width of 25 kHz, 50 kHz or 100 kHz, the receiving system shall provide an adequate and intelligible audio output when the signal specified at 2.2.2.2 has a carrier frequency within plus or minus 0.005 per cent of the assigned frequency. When tuned to a channel having a width of 8.33 kHz, the receiving system shall provide an adequate and intelligible audio output when the signal specified at 2.2.2.2 has a carrier frequency within plus or minus 0.0005 per cent of the assigned frequency. Further information on the effective acceptance bandwidth is contained in the Attachment to CAR-ANS Part 8: Guidance Material for Communication Systems.

Note — The effective acceptance bandwidth includes Doppler shift.

8.2.2.2.4 *Adjacent channel rejection.* The receiving system shall ensure an effective rejection of 60 dB or more at the next assignable channel.

Note — The next assignable frequency will normally be plus or minus 50 kHz. Where this channel spacing will not suffice, the next assignable frequency will be plus or minus 25 kHz, or plus or minus 8.33 kHz, implemented in accordance with the provisions of CAR-ANS Part 13. It is recognized that in certain areas of the world receivers designed for 25 kHz, 50 kHz or 100 kHz channel spacing may continue to be used.

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8.2.3 SYSTEM CHARACTERISTICS OF THE AIRBORNE INSTALLATION

8.2.3.1 Transmitting function

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8.2.3.1.5 Means shall be provided to maintain the average modulation factor at the highest practicable value without overmodulation.

8.2.3.2 Receiving function

8.2.3.2.1 *Frequency stability.* Where 8.33 kHz channel spacing is introduced in accordance with CAR-ANS Part 13, the radio frequency of operation shall not vary more than plus or minus 0.0005 per cent from the assigned frequency.

8.2.3.2.2 SENSITIVITY

8.2.3.2.2.1 After due allowance has been made for aircraft feeder mismatch, attenuation loss and antenna polar diagram variation, the sensitivity of the receiving function shall be such as to provide on a high percentage of occasions an audio output signal with a wanted/unwanted ratio of 15 dB, with a 50 per cent amplitude modulated (A3E) radio signal having a field strength of 75 microvolts per metre (minus 109 dBW/m^2).

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8.2.3.2.3 *Effective acceptance bandwidth for 100 kHz, 50 kHz and 25 kHz channel spacing receiving installations.* When tuned to a channel designated in CAR-ANS Part 13 as having a width of 25 kHz, 50 kHz or 100 kHz, the receiving function shall ensure an effective acceptance bandwidth as follows:

a) in areas where offset carrier systems are employed, the receiving function shall provide an adequate audio output when the signal specified at 8.2.3.2.2 has a carrier frequency within 8 kHz of the assigned frequency;

b) in areas where offset carrier systems are not employed, the receiving function shall provide an adequate audio output when the signal specified at 8.2.3.2.2 has a carrier frequency of plus or minus 0.005 per cent of the assigned frequency.

8.2.3.2.4 *Effective acceptance bandwidth for 8.33 kHz channel spacing receiving installations.* When tuned to a channel designated in CAR-ANS Part 13, as having a width of 8.33 kHz, the receiving function shall ensure an effective acceptance bandwidth as follows:

a) in areas where offset carrier systems are employed, the receiving function shall provide an adequate audio output when the signal specified in 8.2.3.2.2 has a carrier frequency of plus or minus 2.5 kHz of the assigned frequency; and

b) in areas where offset carrier systems are not employed, the receiving function shall provide an adequate audio output when the signal specified in 8.2.3.2.2 has a carrier frequency within plus or minus 0.0005 per cent of the assigned frequency. Further information on the effective acceptance bandwidth is contained in Attachment A to CAR-ANS Part 13.

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Note 2 — When using offset carrier systems (ref. 8.2.3.2.3 and 8.2.3.2.4), receiver performance may become degraded when receiving two or more similar strength offset carrier signals. Caution is therefore advised with the implementation of offset carrier systems.

. . .

a) *8.33 kHz channels*: 60 dB or more at plus or minus 8.33 kHz with respect to the assigned frequency, and 40 dB or more at plus or minus 6.5 kHz;

Note - The receiver local oscillator phase noise should be sufficiently low to avoid any degradation of the receiver capability to reject off carrier signals. A phase noise level better than minus 99 dBc/Hz 8.33 kHz away from the carrier is necessary to comply with 45 dB adjacent channel rejection under all operating conditions.

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8.2.3.2.6 Whenever practicable, the receiving system shall ensure an effective adjacent channel rejection characteristic of 60 dB or more at plus or minus 25 kHz, 50 kHz and 100 kHz from the assigned frequency for receiving systems intended to operate in channel spacing environments of 25 kHz, 50 kHz and 100 kHz, respectively.

. . .

8.2.3.2.7 In the case of receivers complying with 8.2.3.2.3 or 8.2.3.2.4 used in areas where offset carrier systems are in force, the characteristics of the receiver shall be such that:

. . .

8.2.3.2.8 VDL — INTERFERENCE IMMUNITY PERFORMANCE

8.2.3.2.8.1 For equipment intended to be used in independent operations of services applying DSB-AM and VDL technology on board the same aircraft, the receiving function shall provide

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an adequate and intelligible audio output with a desired signal field strength of not more than 150 microvolts per metre (minus 102 dBW/m^2) and with an undesired VDL signal field strength of at least 50 dB above the desired field strength on any assignable channel 100 kHz or more away from the assigned channel of the desired signal.

Note — This level of VDL interference immunity performance provides a receiver performance consistent with the influence of the VDL RF spectrum mask as specified in CAR-ANS 7.6.3.4 with an effective transmitter/receiver isolation of 68 dB. Better transmitter and receiver performance could result in less isolation required.

8.2.3.2.8.2 The receiving function of all new installations intended to be used in independent operations of services applying DSB-AM and VDL technology on board the same aircraft shall meet the provisions of 8.2.3.2.8.1.

8.2.3.2.8.3 The receiving function of all installations intended to be used in independent operations of services applying DSB-AM and VDL technology on board the same aircraft shall meet the provisions of 8.2.3.2.8.1, subject to the conditions of 8.2.3.2.8.4.

8.2.3.2.8.4 Requirements for mandatory compliance of the provisions of 8.2.3.2.8.3 shall be made on the basis of regional air navigation agreements which specify the airspace of operation and the implementation timescales.

8.2.3.2.8.4.1 The agreement indicated in 8.2.3.2.8.4 shall provide at least two years' notice of mandatory compliance of airborne systems.

8.2.3.3 Interference immunity performance

8.2.3.3.1 The VHF communications receiving system shall provide satisfactory performance in the presence of two signal, third-order intermodulation products caused by VHF FM broadcast signals having levels at the receiver input of minus 5 dBm.

8.2.3.3.2 The VHF communications receiving system shall not be desensitized in the presence of VHF FM broadcast signals having levels at the receiver input of minus 5 dBm.

Note - Guidance material on immunity criteria to be used for the performance quoted in 8.2.3.3.1 and 8.2.3.3.2 is contained in the Attachment to Part 8, 1.3.

8.2.3.3.3 All new installations of airborne VHF communications receiving systems shall meet the provisions of 8.2.3.3.1 and 8.2.3.3.2.

8.2.3.3.4 Airborne VHF communications receiving systems meeting the immunity performance Standards of 8.2.3.3.1 and 8.2.3.3.2 shall be placed into operation at the earliest possible date.

. . .

8.2.4.1.1 FREQUENCY RANGE

8.2.4.1.1.1 HF SSB installations shall be capable of operation at any SSB carrier (reference) frequency available to the Aeronautical Mobile (R) Service in the band 2.8 MHz to 22 MHz and necessary to meet the approved assignment plan for the region(s) in which the system is intended to operate, and in compliance with the relevant provisions of the Radio Regulations.
Note 1 —See Introduction to CAR-ANS Part 13,13.3, and Figures 8.2-1 and 8.2-2 at the end of this chapter
Note 2 — The ITU World Administrative Radio Conference, Aeronautical Mobile (R) Service, Geneva, 1978, established a new Allotment Plan (Appendix 27, Aer to the Radio Regulations) based on single sideband replacing the earlier double sideband Allotment Plan. The World

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Radio communication Conference 1995 redesignated it as Appendix S.27. Minor editorial changes were made at the World Radio communication Conference 1997.

. . .

8.2.4.1.4.1 The system shall utilize the suppressed carrier class of emission J3E (also J7B and J9B as applicable). When SELCAL is employed as specified in 8.3 of CAR-ANS Part 8, the installation shall utilize class H2B emission.

8.2.4.1.4.2 Aeronautical stations and aircraft stations shall have introduced the appropriate class(es) of emission prescribed in 8.2.4.1.4.1. The use of class A3E emission shall be discontinued except as provided in 8.2.4.1.4.4 below.

8.2.4.1.4.3 Aeronautical stations and aircraft stations equipped for single sideband operations shall also be equipped to transmit class H3E emission where required to be compatible with reception by double sideband equipment. The use of class H3E emission shall be discontinued except as provided in 8.2.4.1.4.4.

. . .

8.2.4.1.5.1 For radiotelephone emissions the audio frequencies shall be limited to between 300 and 2 700 Hz and the occupied bandwidth of other authorized emissions shall not exceed the upper limit of J3E emissions. In specifying these limits, however, no restriction in their extension shall be implied in so far as emissions other than J3E are concerned, provided that the limits of unwanted emissions are met (see 8.2.4.1.7).

Note — For aircraft and aeronautical station transmitter types first installed before 1 February 1983 the audio frequencies will be limited to 3 000 Hz.

. . .

8.2.4.1.6.2 The basic frequency stability of the receiving function shall be such that, with the transmitting function stabilities specified in 8.2.4.1.6.1, the overall frequency difference between ground and airborne functions achieved in service and including Doppler shift, does not exceed 45 Hz. However, a greater frequency difference shall be permitted in the case of supersonic aircraft.

. . .

8.2.4.1.7.2 For aircraft station transmitters first installed after 1 February 1983 and for aeronautical station transmitters in use as of 1 February 1983 and using single sideband classes of emission H2B, H3E, J3E, J7B or J9B, the peak envelope power (P_p) of any emission on any discrete frequency shall be less than the peak envelope power (P_p) of the transmitter in accordance with the following:

. . .

— on any frequency removed from the assigned frequency by 7.5 kHz or more:

a) aircraft station transmitters: 43 dB;

b) aeronautical station transmitters: for transmitter power up to and including 50 W:

$$[43 + 10 \log 10 Pp\ (W)]\ dB$$

For transmitter power more than 50 W: 60 dB.

Note — See Figures 8.2-1 and 8.2-2 at the end of CAR-ANS 8.2.

8.2.4.1.8 POWER

. . .

S27/60 Unless otherwise specified in Part II of this Appendix (ITU Radio Regulations), the peak envelope powers supplied to the antenna transmission line shall not exceed the maximum

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values indicated in the table below; the corresponding peak effective radiated powers being assumed to be equal to two-thirds of these values:

Class of emission	*Stations*	*Max. peak envelope power (P_p)*
H2B, J3E, J7B, J9B, A3E*, H3E* (100% modulation)	Aeronautical stations Aircraft stations	6 kW 400 W
Other emission such as A1A, F1B	Aeronautical stations Aircraft stations	1.5 kW 100 W

* A3E and H3E to be used only on 3 023 kHz and 5 680 kHz.

8.2.4.1.9 *Method of operation.* Single channel simplex shall be employed.

FIGURES FOR CAR-ANS 8.2

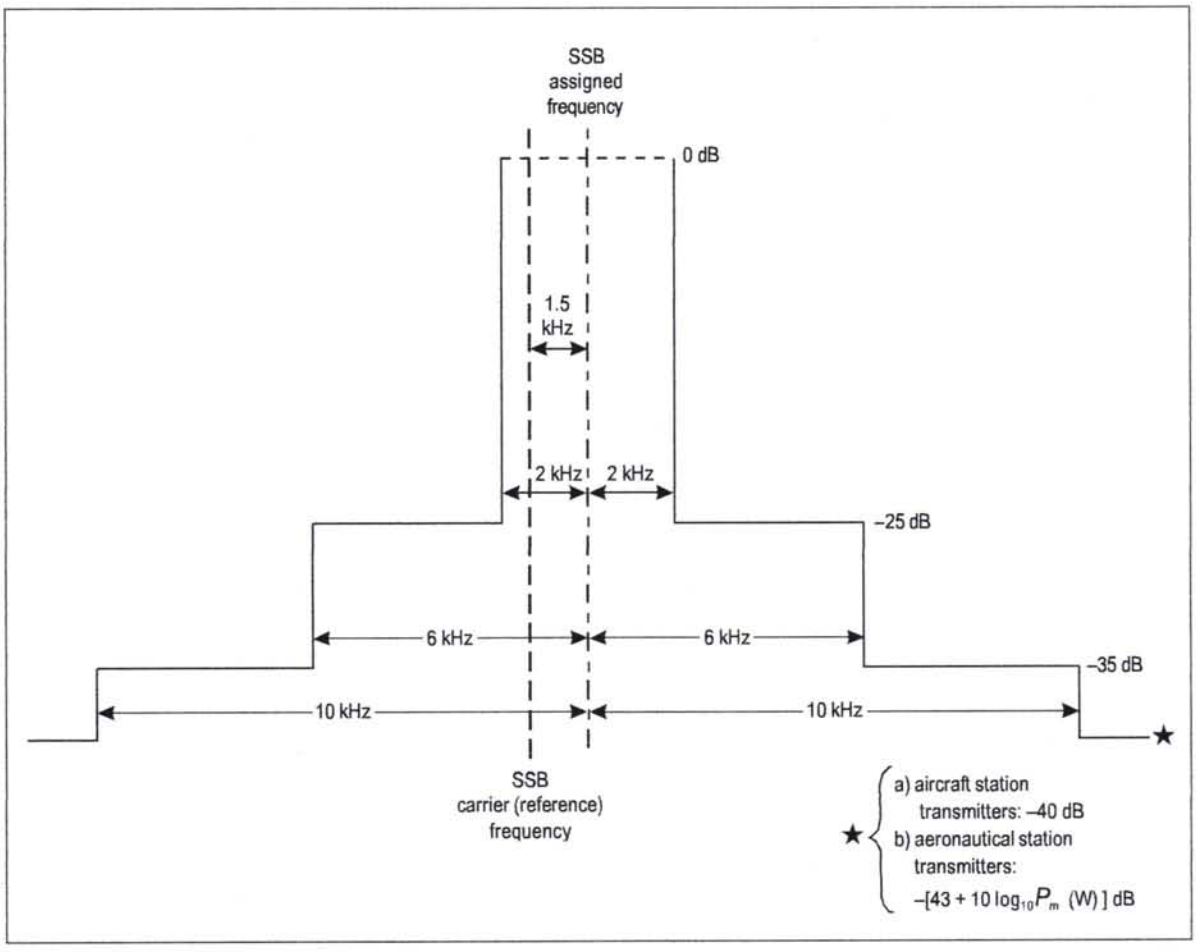

Figure 8.2-1. Required spectrum limits (in terms of mean power) for aircraft station transmitter types and for aeronautical station transmitters first installed before 1 February 1983

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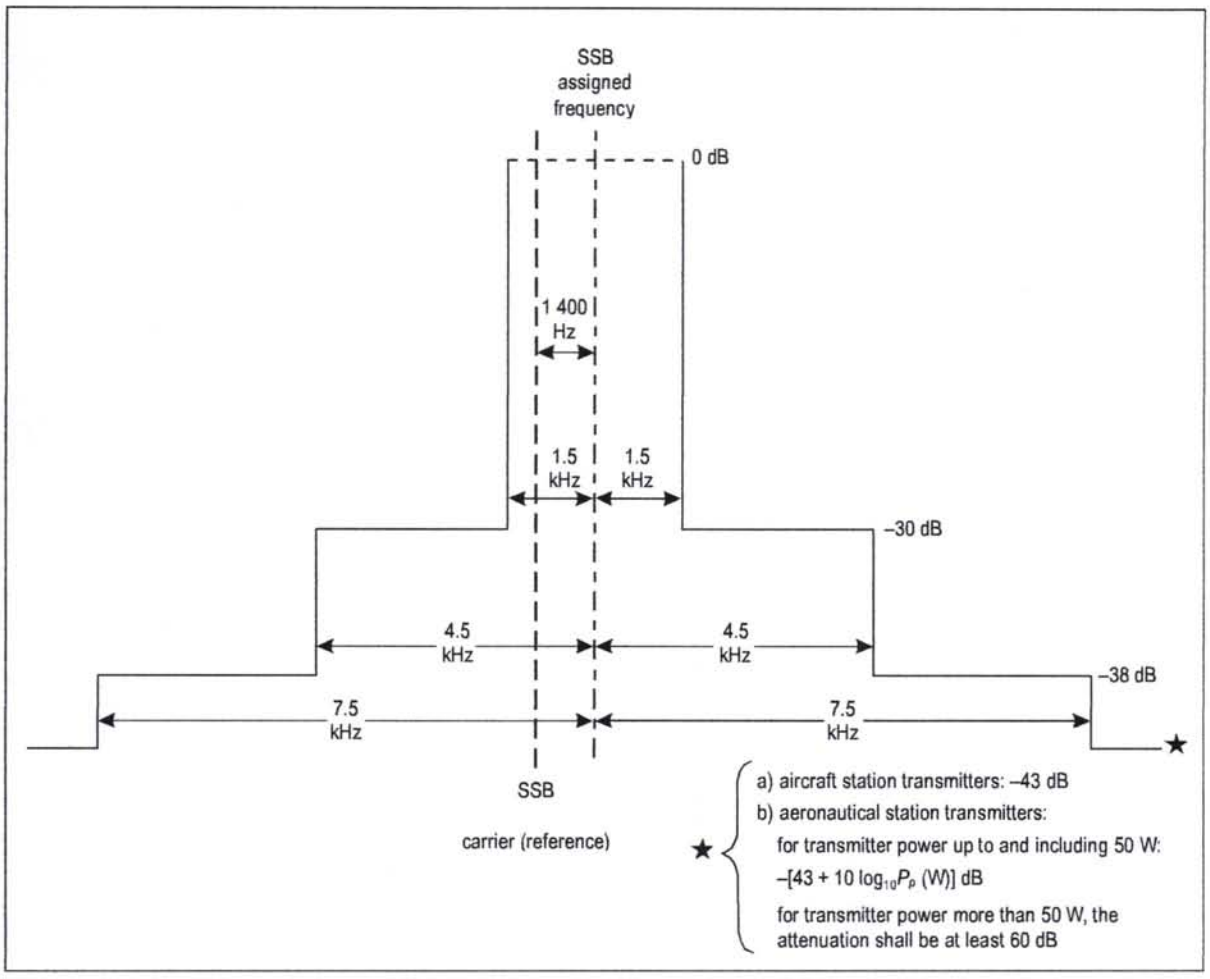

Figure 8.2-2. Required spectrum limits (in terms of peak power) for aircraft station transmitters first installed after 1 February 1983 and aeronautical station transmitters in use after 1 February 1983

8.3 SELCAL SYSTEM

8.3.1 Where a SELCAL system is installed, the following system characteristics shall be applied:

. . .

e) *Transmitted tones.* Tone codes shall be made up of various combinations of the tones listed in the following table and designated by color and letter as indicated:

Designation	*Frequency (Hz)*
Red A	*312.6*
Red B	*346.7*
Red C	*384.6*
Red D	*426.6*
Red E	*473.2*
Red F	*524.8*
Red G	*582.1*
Red H	*645.7*
Red J	*716.1*
Red K	*794.3*

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Red L	*881.0*
Red M	*977.2*
Red P	*1 083.9*
Red Q	*1 202.3*
Red R	*1 333.5*
Red S	*1 479.1*

Note 1 — It should be noted that the tones are spaced by Log–1 0.045 to avoid the possibility of harmonic combinations.

Note 2 — In accordance with the application principles developed by the Sixth Session of the Communications Division, the only codes at present used internationally are selected from the red group.

Note 3 — Guidance material on the use of SELCAL systems is contained in the Attachment to CAR-ANS Part 8, Guidance Material for Communication Systems.

Note 4 — The tones Red P, Red Q, Red R, and Red S are applicable, in accordance with 8.3.2

8.3.2 Aeronautical stations which are required to communicate with SELCAL-equipped aircraft shall have SELCAL encoders in accordance with the red group in the table of tone frequencies of 8.3.1. SELCAL codes using the tones Red P, Red Q, Red R, and Red S may be assigned.

. . .

8.4 AERONAUTICAL SPEECH CIRCUITS

8.4.1 TECHNICAL PROVISIONS RELATING TO INTERNATIONAL AERONAUTICAL SPEECH CIRCUIT SWITCHING AND SIGNALLING FOR GROUND-GROUND APPLICATIONS

Note.— Guidance material on the implementation of aeronautical speech circuit switching and signalling for ground-ground applications is contained in the Manual on Air Traffic Services (ATS) Ground-Ground Voice Switching and Signalling (Doc 9804). The material includes explanation of terms, performance parameters, guidance on basic call types and additional functions, references to appropriate ISO/IEC international standards and ITU-T recommendations, guidance on the use of signalling systems, details of the recommended numbering scheme and guidance on migration to future schemes.

. . .

8.4.1.3 The ATC communication requirements defined in CAR-ANS Part 11, 11.6.2 shall be met by implementation of one or more of the following basic three call types:. . .

8.8.4.1.4 In addition to the ability to make basic telephone calls, the following functions shall be provided in order to meet the requirements set out in CAR-ANS Part 11:

. . .

8.4.1.5 The characteristics of the circuits used in aeronautical speech circuit switching and signalling shall conform to appropriate ISO/IEC international standards and ITU-T recommendations.

8.4.1.6 Digital signalling systems shall be used wherever their use can be justified in terms of any of the following:

. . .

8.4.1.7 The characteristics of supervisory tones to be used (such as ringing, busy, number unobtainable) shall conform to appropriate ITU-T recommendations.

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8.4.1.8 To take advantage of the benefits of interconnecting regional and national aeronautical speech networks, the international aeronautical telephone network numbering scheme shall be used.

8.5 EMERGENCY LOCATOR TRANSMITTER (ELT) FOR SEARCH AND RESCUE

8.5.1 GENERAL

8.5.1.1 Until 1 January 2005, emergency locator transmitters shall operate either on both 406 MHz and 121.5 MHz or on 121.5 MHz.

Note — ELTs operating on 121.5 MHz will be required to meet the improved technical characteristics contained in 8.5.2.1.8.

8.5.1.2 All installations of emergency locator transmitters operating on 406 MHz shall meet the provisions of 8.5.3.

8.5.1.3 All installations of emergency locator transmitters operating on 121.5 MHz shall meet the provisions of 8.5.2.

8.5.1.4 Emergency locator transmitters shall operate on 406 MHz and 121.5 MHz simultaneously.

8.5.1.5 All emergency locator transmitters shall operate simultaneously on 406 MHz and 121.5 MHz.

8.5.1.6 The technical characteristics for the 406 MHz component of an integrated ELT shall be in accordance with 8.5.3.

8.5.1.7 The technical characteristics for the 121.5 MHz component of an integrated ELT shall be in accordance with 8.5.2.

. . .

8.5.1.9 ELT register information shall include the following:

a) transmitter identification (expressed in the form of an alphanumerical code of 15 hexadecimal characters);

. . .

g) colour of the aircraft.

* COSPAS – Space system for search of vessels in distress;
SARSAT – Search and rescue satellite-aided tracking

Note 1 — Various coding protocols are available to ICAO Member States. Depending on the protocol adopted, States may, at their discretion, include one of the following as supplementary identification information to be registered:

a) aircraft operating agency designator and operator's serial number; or
b) 24-bit aircraft address; or
c) aircraft nationality and registration marks.

The aircraft operating agency designator is allocated to the operator by ICAO through the CAAP, and the operator's serial number is allocated by the operator from the block 0001 to 4096.

Note 2.— At their discretion, depending on arrangements in place, States may include other relevant information to be registered such as the last date of register, battery expiry date and place of ELT in the aircraft (e.g. "primary ELT" or "life-raft No. 1").

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8.5.2 SPECIFICATION FOR THE 121.5 MHz COMPONENT OF EMERGENCY LOCATOR TRANSMITTER (ELT) FOR SEARCH AND RESCUE

Note 1 — Information on technical characteristics and operational performance of 121.5 MHz ELTs is contained in RTCA Document DO-183 and European Organization for Civil Aviation Equipment (EUROCAE) Document ED.62.

Note 2 — Technical characteristics of emergency locator transmitters operating on 121.5 MHz are contained in ITU-R Recommendation M.690-1. The ITU designation for an ELT is Emergency Position — Indicating Radio Beacon (EPIRB).

. . .

8.5.2.1.4 The type of emission shall be A3X. Any other type of modulation that meets the requirements of 8.5.2.1.5, 8.5.2.1.6, and 8.5.2.1.7 may be used provided that it will not prejudice precise location of the beacon by homing equipment.

. . .

8.5.2.1.8 The emission shall include a clearly defined carrier frequency distinct from the modulation sideband components; in particular, at least 30 per cent of the power shall be contained at all times within plus or minus 30 Hz of the carrier frequency on 121.5 MHz.

8.5.3 SPECIFICATION FOR THE 406 MHz COMPONENT OF EMERGENCY LOCATOR TRANSMITTER (ELT) FOR SEARCH AND RESCUE

8.5.3.1 Technical characteristics

Note 1 — Transmission characteristics for 406 MHz emergency locator transmitters are contained in ITU-R M.633.

Note 2 — Information on technical characteristics and operational performance of 406 MHz ELTs is contained in RTCA Document DO-204 and European Organization for Civil Aviation Equipment (EUROCAE) Document ED-62.

8.5.3.1.1 Emergency locator transmitters shall operate on one of the frequency channels assigned for use in the frequency band 406.0 to 406.1 MHz.

Note — The COSPAS-SARSAT 406 MHz channel assignment plan is contained in COSPAS-SARSAT Document C/S T.012.

. . .

APPENDIX TO CAR-ANS 8.5
EMERGENCY LOCATOR TRANSMITTER CODING

(see Chapter 8.5, 8.5.3.2

Note.— A detailed description of beacon coding is contained in Specification for COSPAS-SARSAT 406 MHz Distress Beacons (C/S T.001). The following technical specifications are specific to emergency locator transmitters used in aviation.

1. GENERAL

1.1 The emergency locator transmitter (ELT) operating on406 MHz shall have the capacity to transmit a programmed digital message which contains information related to the ELT and/or the aircraft on which it is carried.

1.2 The ELT shall be uniquely coded in accordance with 1.3 and be registered with the appropriate authority.

1.3 The ELT digital message shall contain either the transmitter serial number or one of the following information elements:

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a) aircraft operating agency designator and a serial number;
b) 24-bit aircraft address;
c) aircraft nationality and registration marks.

1.4 All ELTs shall be designed for operation with the COSPAS-SARSAT (COSPAS = Space system for search of vessels in distress; SARSAT = Search and rescue satellite-aided tracking) system and be type approved.

Note.— Transmission characteristics of the ELT signal can be confirmed by making use of the COSPAS-SARSAT Type Approval Standard (C/S T.007).

2. ELT CODING

2.1 The ELT digital message shall contain information relating to the message format, coding protocol, country code, identification data and location data, as appropriate.

2.2 For ELTs with no navigation data provided, the short message format C/S T.001 shall be used, making use of bits 1 through 112. For ELTs with navigation data, if provided, the long message format shall be used, making use of bits 1 through 144.

2.3 Protected data field

2.3.1 The protected data field consisting of bits 25 through 85 shall be protected by an error correcting code and shall be the portion of the message which shall be unique in every distress ELT.

2.3.2 A message format flag indicated by bit 25 shall be set to "0" to indicate the short message format or set to "1" to indicate the long format for ELTs capable of providing location data.

2.3.3 A protocol flag shall be indicated by bit 26 and shall be set to "1" for user and user location protocols, and "0" for location protocols.

2.3.4 A country code, which indicates the State where additional data are available on the aircraft on which the ELT is carried, shall be contained in bits 27 through 36 which designate a three-digit decimal country code number expressed in binary notation.

Note.— Country codes are based on the International Telecommunication Union (ITU) country codes shown in Table 4 of Part I, Volume I of the ITU List of Call Signs and Numerical Identities.

2.3.5 Bits 37 through 39 (user and user location protocols)or bits 37 through 40 (location protocols) shall designate one of the protocols where values "001" and "011" or "0011", "0100", "0101", and "1000" are used for aviation as shown in the examples contained in this appendix.

2.3.6 The ELT digital message shall contain either the transmitter serial number or an identification of the aircraft or operator as shown below.

2.3.7 In the serial user and serial user location protocol(designated by bit 26=1 and bits 37 through 39 being "011"), the serial identification data shall be encoded in binary notation with the least significant bit on the right. Bits 40 through 42 shall indicate type of ELT serial identification data encoded where:

— "000" indicates ELT serial number (binary notation) is encoded in bits 44 through 63;

— "001" indicates aircraft operator (3 letter encoded using modified Baudot code shown in Table 5-1) and a serial number (binary notation) are encoded in bits 44 through 61 and 62 through 73, respectively;

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— "011" indicates the 24-bit aircraft address is encoded in bits 44 through 67 and each additional ELT number (binary notation) on the same aircraft is encoded in bits 68 through 73.

Note.— States will ensure that each beacon, coded with the country code of the State, is uniquely coded and registered in a database. Unique coding of serialized coded beacons can be facilitated by including the COSPAS-SARSAT Type Approval Certificate Number which is a unique number assigned by COSPAS-SARSAT for each approved ELT model, as part of the ELT message.

2.3.8 In the aviation user or user location protocol (designated by bit 26=1 and bits 37 through 39 being "001"), the aircraft nationality and registration marking shall be encoded in bits 40 through 81, using the modified Baudot code shown in Table 8.5-1 to encode seven alphanumeric characters. This data shall be right justified with the modified Baudot "space" ("100100") being used where no character exists.

2.3.9 Bits 84 and 85 (user or user location protocol) or bit 112 (location protocols) shall indicate any homing transmitter that may be integrated in the ELT.

2.3.10 In standard and national location protocols, all identification and location data shall be encoded in binary notation with the least significant bit right justified. The aircraft operator designator (3 letter code) shall be encoded in 15 bits using a modified Baudot code (Table 8.5-1) using only the 5 right most bits per letter and dropping the left most bit which has a value of 1 for letters.

Table 8.5-1 Modified Baudot code

Letter	*Code MSB LSB*	*Figure*	*Code MSB LSB*
A	111000	(-)*	011000
B	110011		
C	101110		
D	110010		
E	110000	3	010000
F	110110		
G	101011		
H	100101		
I	101100		
J	111010	8	001100
K	111110		
L	101001		
M	100111		
N	100110		
O	100011	9	000011
P	101101	0	001101
Q	111101	1	011101
R	101010	4	001010
S	110100		
T	100001	5	000001
U	111100	7	011100
V	101111		
W	111001	2	011001
X	110111	/	010111
Y	110101	6	010101

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Letter	*Code MSB LSB*	*Figure*	*Code MSB LSB*
Z	110001		
( )**	100100		

MSB = most significant bit
LSB = least significant bit
* = hypen
** = space

EXAMPLES OF CODING

ELT serial number

25		27 36	37			40				44 63	64 73	74 83	85	
F	1	COUNTRY	0	1	1	T	T	T	C	SERIAL NUMBER DATA (20 BITS)	SEE NOTE 1	SEE NOTE 2	A	A

Aircraft address

25		27 36	37			40				44 67	68 73	74 83	85	
F	1	COUNTRY	0	1	1	T	T	T	C	AIRCRAFT ADDRESS (24 BITS)	SEE NOTE 3	SEE NOTE 2	A	A

Aircraft operator designator and serial number

25		27 36	37			40				44 61	62 73	74 83	85	
F	1	COUNTRY	0	1	1	T	T	T	C	OPERATOR 3-LETTER DESIGNATOR	SERIAL NUMBER 1-4096	SEE NOTE 2	A	A

Aircraft registration marking

25		27 36	37			40 81	83		85	
F	1	COUNTRY	0	0	1	AIRCRAFT REGISTRATION MARKING (UP TO 7 ALPHANUMERIC CHARACTERS) (42 BITS)	0	0	A	A

T = Beacon type TTT: = 000 indicates ELT serial number is encoded;
= 001 indicates operating agency and serial number are encoded;
= 011 indicates 24-bit aircraft address is encoded.

C = Certificate flag bit: 1 = to indicate that COSPAS-SARSAT Type Approval Certificate number is encoded in bits 74 through 83 and
0 = otherwise

F = Format flag 0 = Short Message
1 = Long Message

A = Auxiliary radio-locating device: 00 = no auxiliary radio-locating device
01 = 121.5 MHz
11 = other auxiliary radio-locating device

Note 1.— 10 bits, all 0s or National use.

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Note 2.— COSPAS-SARSAT Type Approval Certificate number in binary notation with the least significant bit on the right, or National use.

Note 3.— Serial number, in binary notation with the least significant bit on the right, of additional ELTs carried in the same aircraft or default to 0s when only one ELT is carried.

EXAMPLE OF CODING (USER LOCATION PROTOCOL)

25	26	←27 36→	←37 39→	←40 83→	85→	←86 106→	←107 112→	←113 132→			←133 144→
1	1	10	3	44	2	21	1	12			13			12
1	1	CC	T	IDENTIFICATION DATA (AS IN ANY OF USER PROTOCOLS ABOVE)	A	21-BIT BCH ERROR CORRECTING CODE	E	LATITUDE			LONGITUDE			12-BIT BCH ERROR CORRECTING CODE
								1	7	4	1	8	4	
								N / S	DEG 0–90 (1 d)	MIN 0–56 (4m)	E / W	DEG 0–180 (1 d)	MIN 0–56 (4m)	

CC = Country Code;
E = Encoded position data source: 1 = Internal navigation device, 0 = External navigation device

EXAMPLE OF CODING (STANDARD LOCATION PROTOCOL)

25	26	←27 36	←37 40→ |←41	85→	←86 106→	107 112	←113 132→	←133 144→
←	61 BITS	→				←	26 BITS	→	
1	1	10	4	45	21	6	20	12
1	0	CC	PC	IDENTIFICATION DATA / LATITUDE / LONGITUDE	21-BIT BCH CODE	SD	Δ LATITUDE / Δ LONGITUDE	12-BIT BCH CODE

PC	IDENTIFICATION DATA		LATITUDE		LONGITUDE		21-BIT BCH CODE	SD	Δ LATITUDE			Δ LONGITUDE			12-BIT BCH CODE
	24		1	9	1	10			1	5	4	1	5	4	
0011	AIRCRAFT 24 BIT ADDRESS		N = 0 S = 1	LAT DEG 0–90 (1/4 d)	E = 0 W = 1	LON DEG 0–180 (1/4 d)			– = 0 + = 1	MINUTES 0–30 (1 m)	SECONDS 0–56 (4 s)	– = 0 + = 1	MINUTES 0–30 (1 m)	SECONDS 0–56 (4 s)	
0101	15 AIRCRAFT OPER. DESIGNATOR	9 SERIAL No 1–511													
0100	10 C/STA No 1–1023	14 SERIAL No 1–16383													

CC = Country Code;

PC = Protocol Code 0011 indicates 24-bit aircraft address is encoded;
0101 indicates operating agency and serial number are encoded;
0100 indicates ELT serial number is encoded.

SD = Supplementary Data bits 107 – 110 = 1101;
bit 111 = Encoded Position Data Source (1 = internal; 0 = external)
bit 112: 1 = 121.5 MHz auxiliary radio locating device;
0 = other or no auxiliary radio locating device.

Note 1.— Further details on protocol coding can be found in Specification for COSPAS-SARSAT 406 MHz Distress Beacon (C/S T.001).

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Note 2. — All identification and location data are to be encoded in binary notation with the least significant bit on the right except for the aircraft operator designator (3 letter code).

Note 3. — For details on BCH error correcting code see Specification for COSPAS-SARSAT 406 MHz Distress Beacon (C/S T.001).

EXAMPLE OF CODING (NATIONAL LOCATION PROTOCOL)

25	26	←27 36→	←37 40→|←41							←86 106→	107 11	←113							←133 144→
← 61 BITS PDF-1 →										BCH-1	← 26 BITS PDF-2 →								BCH-2
1	1	10	4	45						21	6	7			7			6	12
1	0	CC	1000	18 bits ID	27 bits LATITUDE				LONGITUDE		SD	ΔLATITUDE			ΔLONGITUDE			NU	
				18	1	7	5	1	8	5		1	2	4	1	2	4		
				NATIONAL ID NUMBER	N = 0 S = 1	DEGREES 0–90 (1 d)	MINUTES 0–58 (2 m)	E = 0 W = 1	DEGREES 0–180 (1 d)	MINUTES 0–58 (2 m)	21-BIT BCH CODE	– = 0 + = 1	MINUTES 0–3 (1 m)	SECONDS 0–56 (4 s)	– = 0 + = 1	MINUTES 0–3 (1 m)	SECONDS 0–56 (4 s)		12-BIT BCH CODE

CC = Country Code;

ID = Identification Data = 8-bit identification data consisting of a serial number assigned by the appropriate national authority

SD = Supplementary Data = bits 107 – 109 = 110;
bit 110 = Additional Data Flag describing the use of bits 113 to 132: 1 = Delta position; 0 = National assignment;
bit 111 = Encoded Position Data Source: 1 = internal, 0 = external;
bit 112: 1 = 121.5 MHz auxiliary radio locating device; 0 = other or no device

NU = National use = 6 bits reserved for national use (additional beacon type identification or other uses).

Note 1.— Further details on protocol coding can be found in Specification for COSPAS-SARSAT 406 MHz Distress Beacon (C/S T.001).

Note 2.— All identification and location data are to be encoded in binary notation with the least significant bit on the right.

Note 3.— For details on BCH error correcting code see Specification for COSPAS-SARSAT 406 MHZ Distress Beacon (C/S T.001).

ATTACHMENT TO CAR-ANS PART 8.

GUIDANCE MATERIAL FOR COMMUNICATION SYSTEMS

1. VHF COMMUNICATIONS

1.1 Audio characteristics of VHF communication equipment

1.1.1 The aeronautical radiotelephony services represent a special case of the application of radiotelephony, in that the requirement is for the transmission of messages in such a way that

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fidelity of wave form is of secondary importance, emphasis being upon fidelity of basic intelligence. This means that it is not necessary to transmit those parts of the wave form which are solely concerned with individuality, accent and emphasis.

1.1.2 The effective acceptance bandwidth for 8.33 kHz equipment is required to be at least plus and minus 3 462 Hz. This value considers the general case, i.e. air-to-ground transmissions and consists of 2 500 Hz audio bandwidth, 685 Hz for an aircraft transmitter instability of 5 ppm, 137 Hz for a ground receiver instability of1 ppm and 140 Hz due to Doppler shift (Refer to 8.2.2.2.4 and 8.2.3.2.6).

1.2 Offset carrier system in 25 kHz,50 kHz and 100 kHz spaced channels

The following are examples of offset carrier systems which meet the requirements of 8.2.2.1.1.1.

a) 2-carrier system. Carriers should be spaced at plus and minus 5 kHz. This requires a frequency stability of plus or minus 2 kHz (15.3 parts per million at 130 MHz).

b) 3-carrier system. Carriers should be spaced at zero and plus and minus 7.3 kHz. This requires a frequency stability of plus or minus 0.65 kHz (5 parts per million at 130 MHz).

The following are examples or 4- and 5-carrier systems which meet the requirements of 8.2.2.1.1.1.

c) 4-carrier system. Carriers should be spaced at plus and minus 2.5 kHz and plus and minus 7.5 kHz. This requires a frequency stability of plus or minus 0.5 kHz (3.8 parts per million at 130 MHz).

d) 5-carrier system. Carriers should be spaced at zero, plus and minus 4 kHz and plus and minus 8 kHz. A frequency stability in the order of plus or minus 40 Hz (0.3 parts per million at 130 MHz) is an achievable and practicable interpretation of the requirement in this case.

Note 1.— The carrier frequency spacings referred to above are with respect to the assigned channel frequency.

Note 2.— In aircraft receivers which employ a measurement of the received carrier-to-noise ratio to operate the mute, the audio heterodynes caused by the reception of two or more off-set carriers can be interpreted as noise and cause the audio output to be muted even when an adequate wanted signal is present. In order that the airborne receiving system can conform with the sensitivity recommendations contained in 8.2.3.2.2, the design of the receivers may need to ensure that their sensitivity is maintained at a high level when receiving off-set carrier transmissions. The use of a carrier level override is an unsatisfactory solution to this requirement, but where it is employed, setting the override level as low as possible can ameliorate the problem.

1.3 Immunity performance of COM receiving systems in the presence of VHF FM broadcast interference

1.3.1 With reference to the Note of 8.2.3.3.2, the immunity performance defined there must be measured against an agreed measure of derogation of the receiving system's normal performance, and in the presence of, and under standard conditions for the input wanted signal. This is necessary to ensure that the checking of receiving station equipment on bench test can be performed to a repeatable set of conditions, and results, and to facilitate their subsequent approval. An adequate measure of immunity performance may be obtained by the use of wanted signal of minus 87 dBm into the receiving equipment and the signal modulated with a 1 kHz tone at 30 per cent modulation depth. The signal-to-noise ratio should not fall below 6

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dB when the interfering signals specified at 8.2.3.3.1 and 8.2.3.3.2 are applied. The broadcast signals should be selected from frequencies in the range between 87.5 and 107.9 MHz and should be modulated with a representative broadcast type signal.

Note 1.— The signal level of minus 87 dBm assumes a combined antenna and feeder gain of 0 dB.

Note 2.— The reduction in the signal-to-noise ratio quoted above is for the purpose of standardization when checking that receiving station equipment on bench measurements meet the required immunity. In the planning of frequencies and in the assessment of protection from FM broadcast interference, a value not less than this, and in many cases higher, depending on the operational circumstances in individual cases, should be chosen as the basis of the interference assessment.

2. SELCAL SYSTEM

2.1 This material is intended to provide information and guidance relating to the operation of the SELCAL system. It is associated with the Recommended Practices contained in CAR-ANS Part 8, 8.3.

a) Function. The purpose of the SELCAL system is to permit the selective calling of individual aircraft over radiotelephone channels linking the ground station with the aircraft, and is intended to operate on en-route frequencies with existing HF and VHF ground-to-air communications transmitters and receivers with a minimum of electrical and mechanical modification. The normal functioning of the ground-to-air communications link should be unaffected, except at such time as the selective calling function is being formed.

b) Principles of operation. Selective calling is accomplished by the coder of the ground transmitter sending a single group of coded tone pulses to the aircraft receiver and decoder. The airborne receiver and decoder equipment is capable of receiving and interpreting, by means of an indicator, the correct code and rejecting all other codes in the presence of random noise and interference. The ground portion of the coding device (ground selective calling unit) supplies coded information to the ground-to-air transmitter. The airborne selective calling unit is the special airborne equipment which operates with existing communications receivers on the aircraft to permit decoding of the ground-to-air signals for display on the signal indicator. The type of signal indicator can be chosen to suit operational requirements of the user and may consist of a lamp, a bell, a chime or any combination of such indicating devices.

EFFECTIVITY CLAUSE:

This amendment shall be added to the Philippine CAR-ANS Part 8, series of 2015 and shall take effect immediately and shall supersede any other memoranda, regulations, and directives in conflict with this provision after publication thereof in the Official Gazette or in a newspaper of general circulation and a copy filed with the University of the Philippines Law Center - Office of the National Administrative Register (UP-ONAR).

So ordered. Signed this 14 day of JUL 2015, CAAP, Pasay City.

LT GEN WILLIAM K HOTCHKISS III AFP (Ret)

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