

Democratic Socialist Republic of Sri Lanka



Civil Aviation Authority of Sri Lanka

Implementing Standards

(Issued under Sec. 120, Civil Aviation Act No. 14 of 2010)

Title: Conformance to Annex-10-Aeronautical Telecommunications Vol. V (Aeronautical Radio Frequency Spectrum Utilization)

Reference No. : CA-IS-2015-ANS-007

SLCAIS: 044

Date: 04th May 2015

Pursuant to Sec.120 of the Civil Aviation Act No.14 of 2010 which is hereinafter referred to as the CA Act, Director General of Civil Aviation shall have the power to issue, whenever he considers it necessary or appropriate to do so, such Implementing Standards for the purpose of giving effect to any provision in the CA Act, Regulations or Rules made thereunder including the Articles of the Convention on International Civil Aviation specified in the Schedule to the CA Act.

Accordingly, I, being the Director General of Civil Aviation do hereby issue the Implementing Standards on **Aeronautical Radio Frequency Spectrum Utilization** as mentioned in the Attachment hereto (Ref: CA-IS-2015-ANS-007-Att.01], elaborating the requirements to be satisfied for the effective implementation of the International Standards and Recommended Practices on 'Aeronautical Radio Frequency Spectrum Utilization' contained in Annex-10 Volume V "Aeronautical Telecommunications" to the Convention and the Air Navigation Regulations of 1955.

This Implementing Standard shall be applicable to Airport & Aviation Services (SL) Ltd, and shall come in to force with immediate effect and remain in force unless revoked.

Attention is also drawn to Sec. 103 of the Act, which states inter alia that failure to comply with Implementing Standard is an offence.

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Enclosure: Attachment No. CA-IS-2015-ANS-007-Att.01

Implementing Standards

SLCAIS-044 : Aeronautical Radio Frequency Spectrum Utilization

GENERAL

Introduction

- A. Requirements contained in this document are based on the amendment 89 of ICAO Annex 10 –Volume V Aeronautical Radio Frequency Spectrum Utilization.
- B. Airport & Aviation Services (SL) Ltd. shall strictly comply with the requirements published in this Document.
- C. This Implementing Standard supersedes the Aviation Safety Notice (ASN) 117 issued by the Director General of Civil Aviation. It may be amended from time to time and the amendments will be reflected with a vertical line on the right side of the text.

Applicability

This Implementing Standard SLCAIS 044 is applicable to Airport & Aviation Services (SL) Ltd. who is authorized by the Director General of Civil Aviation to provide Aeronautical Telecommunication Services for Air Navigation.

1. DEFINITIONS

Alternative means of communication – A means of communication provided with equal status, and in addition to the primary means.

Double channel simplex – Simplex using two frequency channels, one in each direction.

Duplex – A method in which telecommunication between two stations can take place in both directions simultaneously.

Frequency channel – A continuous portion of the frequency spectrum appropriate for a transmission utilizing a specified class of emission.

Note – The classification of emissions and information relevant to the portion of the frequency spectrum appropriate for a given type of transmission (bandwidths) are specified in the Radio Regulations, Article S2 and Appendix S1.

Offset frequency simplex – A variation of single channel simplex wherein telecommunication between two stations is effected by using in each direction frequencies that are intentionally slightly different but contained within a portion of the spectrum allotted for the operation.

Operational control communications – Communications required for the exercise of authority

over the initiation, continuation, diversion or termination of a flight in the interest of the safety of the aircraft and the regularity and efficiency of a flight.

Primary means of communication – The means of communication to be adopted normally by aircraft and ground stations as a first choice where alternative means of communication exist.

Simplex – A method in which telecommunication between two stations takes place in one direction at a time.

Note – In application to the aeronautical mobile service, this method may be subdivided as follows:

- a) single channel simplex;*
- b) double channel simplex;*
- c) offset frequency simplex.*

Single channel simplex – Simplex using the same frequency channel in each direction.

VHF digital link (VDL) -A constituent mobile sub network of the aeronautical Telecommunication network (ATN), operating in the aeronautical mobile VHF frequency band. In addition, the VDL may provide non-ATN functions such as, for instance, digitized voice.

2 DISTRESS FREQUENCIES

2.1 Frequencies for emergency locator transmitters (ELTs) for search and rescue

2.1.1 All emergency locator transmitters carried in compliance with Standards of Annex 6, Parts I, II and III shall operate on both 406 MHz and 121.5MHz or on 121.5 Mhz.

Note 2 – Specifications for ELTs are found in IS 040, Chapter 5.

2.2 Search and rescue frequencies

2.2.1 Where there is a requirement for the use of high frequencies for search and rescue scene of action coordination purposes, the frequencies 3 023 kHz and 5 680 kHz shall be employed.

2.2.2 Where specific frequencies are required for communication between rescue coordination centre's and aircraft engaged in search and rescue operations, they should be selected regionally from the appropriate aeronautical mobile frequency bands in light of the nature of the provisions made for the establishment of search and rescue aircraft.

Note – Where civil commercial aircraft take part in search and rescue operations, they will normally communicate on the appropriate en-route channels with the flight information centre associated with the rescue coordination centre concerned.

3. UTILIZATION OF FREQUENCIES BELOW 30 MHz

3.1 Method of operations

3.1.1 In the aeronautical mobile service, single channel simplex shall be used in radio telephone communications utilizing radio frequencies below 30 MHz in the bands allocated exclusively to the aeronautical mobile (R) service.

3.1.2 Assignment of single sideband channels

3.1.2.1 Single sideband channels shall be assigned in accordance with IS 040, Chapter 2, 2.4.

3.1.2.2 For the operational use of the channels concerned administrations shall take into account the provisions of S27/19 of Appendix S27 of the ITU Radio Regulations.

3.1.2.3 The use of aeronautical mobile (R) frequencies below 30MHz for international operations should be coordinated as specified in Appendix S27 of the ITU Radio Regulations as follows:

S27/19 The International Civil Aviation Organization (ICAO) co-ordinates radio communications of the aeronautical mobile (R) service with international aeronautical operations and this Organization should be consulted in all appropriate cases in the operational use of the frequencies in the Plan.

3.1.2.4 Where international operating requirements for HF communications cannot be satisfied by the Frequency Allotment Plan at Part 2 of Appendix S27 to the Radio Regulations, an appropriate frequency may be assigned as specified in Appendix S27 by the application of the following provisions:

S27/20 It is recognized that not all the sharing possibilities have been exhausted in the Allotment Plan contained in this Appendix. Therefore, in order to satisfy particular operational requirements which are not otherwise met by this Allotment Plan, administrations may assign frequencies from the aeronautical mobile (R) bands in areas other than those to which they are allotted in this Plan. However, the use of the frequencies so assigned must not reduce the protection to the same frequencies in the areas where they are allotted by the Plan below that determined by the application of the procedure defined in Part I, Section II B of this Appendix.

Note – Part I, Section II B of Appendix S27 relates to Interference Range Contours, and application of the procedure results in a protection ratio of 15 dB.

S27/21 When necessary to satisfy the needs of international air operations administrations may adapt the allotment procedure for the assignment of aeronautical Mobile(R) frequencies, which assignments shall then be the subject of prior agreement between administrations affected.

S27/22 The co-ordination described in No. S27/21 shall be effected where appropriate and desirable for the efficient utilization of the frequencies in question, and especially when the procedures of No. S27/19 is unsatisfactory.

3.1.2.5 The use of classes of emission J7B and J9B shall be subject to the following provisions of Appendix S27:

S27/12 for radiotelephone emissions the audio frequencies will be limited to between 300 and 2700 Hz and the occupied bandwidth of other authorized emissions will not exceed the upper limit of J3E emissions. In specifying these limits, however, no restriction in their extension is implied in so far as emissions other than J3E are concerned, provided that the limits of unwanted emissions are met (see Nos. S27/73 and S27/74).

S27/14 On account of the possibility of interference, a given channel should not be used in the same allotment area for radiotelephony and data transmissions.

S27/15 The use of channels derived from the frequencies indicated in S27/18 for the various classes of emissions other than J3E and H2B will be subject to special arrangements by the administrations concerned and affected in order to avoid harmful interference which may result from the simultaneous use of the same channel for several classes of emission.

3.1.3 Assignment of frequencies for aeronautical operational control communications

3.1.3.1 Worldwide frequencies for aeronautical operational control communications are required to enable aircraft operating agencies to meet the obligations prescribed in Annex 6, Part I. Assignment of these frequencies shall be in accordance with the following provisions of Appendix S27:

S27/9 A world-wide allotment area is one in which frequencies are allotted to provide long distance communications between an aeronautical station within that allotment area and aircraft operating anywhere in the world.

*S27/217 The world-wide frequency allotments appearing in the tables at No. S27/213 and Nos. S27/218 to S27/231, except for carrier (reference) frequencies 3 023 kHz and 5 680 kHz, are reserved for assignment by administrations to stations operating under authority granted by the administration concerned for the purpose of serving one or more aircraft operating agencies. Such assignments are to provide communications between appropriate aeronautical station and an aircraft station anywhere in the world for exercising control over regularity of flight and for safety of aircraft. World-wide frequencies are not to be assigned by administrations for MWARA, RDARA and VOLMET purposes. Where the operational area of an aircraft lies wholly within a RDARA or sub-RDARA boundary, frequencies allotted to those RDARAs and sub-RDARAs shall be used.

Note 1 – Tables S27/213 and S27/218 to S27/231 appearing in Appendix S27 to the ITU Radio Regulations refer to, respectively, the Frequency Allotment Plan, listing frequencies by areas, and the Frequency Allotment Plan, listing frequencies in numerical order.

3.2 NDB frequency management

3.2.1 NDB frequency management should take into account the following:

- a) *The interference protection required at the edge of the rated coverage;*
- b) *The application of the figures shown for typical ADF equipment;*
- c) *The geographical spacings and the respective rated coverages;*
- d) *The possibility of interference from spurious radiation generated by non-aeronautical sources (e.g. electric power services, power line communication systems, industrial radiation, etc.).*

Note 2 – Attention is drawn to the fact that some portions of the bands available for aeronautical beacons are shared with other services.

3.2.2 To alleviate frequency congestion problems at locations where two separate ILS facilities serve opposite ends of a single runway, the assignment of a common frequency to both of the outer locators should be permitted, and the assignment of a common frequency to both of the inner locators should be permitted, provided that:

- a) The operational circumstances permit;
- b) Each locator is assigned a different identification signal; and
- c) Arrangements are made whereby locators using the same frequency cannot radiate simultaneously.

Note – The Standard in IS034, 3.4.4.4, specifies the equipment arrangements to be made.

4. UTILIZATION OF FREQUENCIES ABOVE 30.000Mhz.

4.1 Utilization in the band 117.975 – 137.000 MHz

The utilization of VHF on a worldwide basis with due regard to economy and practicability requires a plan that will take into account:

- a) The need for an orderly evolution towards improved operation and the required degree of worldwide standardization;
- b) the desirability of providing for an economic transition from present utilization to optimum utilization of the frequencies available, taking into account the maximum possible utilization of existing equipment;
- c) The need to provide for coordination between international and national utilization so as to ensure mutual protection from interference;
- d) The need for providing a global framework for the integrated development of Regional Plans;
- e) the need, in certain regions, to have more detailed plans and planning criteria in addition to the provisions in this section;
- f) The desirability of incorporating in any group of frequencies to be used those now in uses for international air services;
- g) the need for keeping the total number of frequencies and their grouping in appropriate relation to the airborne equipment known to be widely used by international air services;
- h) A requirement for the provision of a single frequency that may be used for emergency purposes on a worldwide basis and, also, in certain regions, for another frequency that may be used as a common frequency for special purposes; and
- i) The need for providing sufficient flexibility to allow for the differences in application necessitated by regional conditions.

4.1.1 General allotment of frequency band 117.975 – 137 MHz

Note – The plan includes a general Allotment Table that subdivides the complete band 117.975 – 137 MHz, the chief subdivisions being the bands of frequencies allocated to both national and international services, and the bands allocated to national services. Observance of this general subdivision should keep to a minimum the problem of coordinating national and international application.

4.1.1.1 The block allotment of the frequency band 117.975 – 137 MHz shall be as shown in Table 4-1.

4.1.2 Frequency separation and limits of assignable frequencies

Note – In the following text the channel spacing for 8.33 kHz channel assignments is defined as 25 kHz divided by 3 which is 8.333 ... kHz.

4.1.2.1 In the frequency band 117.975 – 137.000 MHz, the lowest assignable frequency shall be 118.000 MHz and the highest 136.975 MHz.

4.1.2.2 The minimum separation between assignable frequencies in the aeronautical mobile (R) service shall be 8.33 kHz.

Note – It is recognized that in some regions or areas, 100 kHz, 50 kHz or 25 kHz channel spacing provides an adequate number of frequencies suitably related to international and national air services and that equipment designed specifically for 100 kHz, 50 kHz or 25 kHz channel spacing will remain adequate for services operating within such regions or areas. It is further recognized that assignments based on 25 kHz channel spacing as well as 8.33 kHz channel spacing may continue to co-exist within one region or area.

4.1.2.3 Requirements for mandatory carriage of equipment specifically designed for 8.33 kHz channel spacing shall be made on the basis of regional air navigation agreements which specify the airspace of operation and the implementation timescales for the carriage of equipment, including the appropriate lead time.

4.1.2.4 Requirements for mandatory carriage of equipment specifically designed for VDL Mode 3 and VDL Mode 4 shall be made on the basis of regional air navigation agreements which specify the airspace of operation and the implementation timescales for the carriage of equipment, including the appropriate lead time.

4.1.2.4.1 The agreement indicated in 4.1.2.4 shall provide at least two years' notice of mandatory carriage of airborne systems.

4.1.2.5 In regions where 25 kHz channel spacing (DSBAM and VHF digital link (VDL)) and 8.33 kHz DSB-AM channel spacing are in operation, the publication of the assigned frequency or channel of operation shall conform to the channel contained in Table 4-1(.bis)

Note - Table 4-1 (bis) provides the frequency channel pairing plan which retains the numerical designator of the 25 kHz DSB-AM environment and allows unique identification of a 25 kHz VDL and 8.33 kHz channel.

Table 4-1. Allotment table

<i>Block allotment of frequencies (MHz)</i>	<i>Worldwide utilization</i>	<i>Remarks</i>
a) 118 – 121.4 inclusive	International and National Aeronautical Mobile Services	Specific international allotments will be determined in the light of regional agreement. National assignments are covered by the provisions in 4.1.5.9.
b) 121.5	Emergency frequency	In order to provide a guard band for the protection of the aeronautical emergency frequency, the nearest assignable frequencies on either side of 121.5 MHz are 121.4 MHz and 121.6 MHz, except that by regional agreement it may be decided that the nearest assignable frequencies are 121.3 MHz and 121.7 MHz.
c) 121.6 – 121.9917 inclusive	International and National Aerodrome Surface Communications	Reserved for ground movement, pre-flight checking, air traffic services clearances, and associated operations.
d) 122 – 123.05 inclusive	National Aeronautical Mobile Services	Reserved for national allotments.
e) 123.1	Auxiliary frequency SAR	See 4.1.4.1.
f) 123.15 – 123.6917 inclusive	National Aeronautical Mobile Services	Reserved for national allotments, with the exception of 123.45 MHz which is also used as the worldwide air-to-air communications channel (see g)).
g) 123.45	Air to air communications	Designated for use as provided for in 4.1.3.2.1.
h) 123.7 – 129.6917 inclusive	International and National Aeronautical Mobile Services	Specific international allotments will be determined in light of regional agreement. National assignments are covered by the provisions in 4.1.5.9.
i) 129.7 – 130.8917 inclusive	National Aeronautical Mobile Services	Reserved for national allotments but may be used in whole or in part, subject to regional agreement, to meet the requirements mentioned in 4.1.8.1.3.
j) 130.9 – 136.875 inclusive	International and National Aeronautical Mobile Services	Specific international allotments will be determined in light of regional agreement. National assignments are covered by the provisions in 4.1.5.9 (See the Introduction to 4.1 regarding the band 132 – 137 MHz.)
k) 136.9 – 136.975 inclusive	International and National Aeronautical Mobile Services	Reserved for VIIF air-ground data link communications.

Table 4-1 (bis). Channelling/frequency pairing

<i>Frequency (MHz)</i>	<i>Time slot*</i>	<i>Channel spacing (kHz)</i>	<i>Channel</i>
118.0000		25	118.000
118.0000	A	25	118.001

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118.0000	B	25	118.002
118.0000	C	25	118.003
118.0000	D	25	118.004
118.0000		8.33	118.005
118.0083		8.33	118.010
118.0167		8.33	118.015
118.0250	A	25	118.021
118.0250	B	25	118.022
118.0250	C	25	118.023
118.0250	D	25	118.024
118.0250		25	118.025
118.0250		8.33	118.030
118.0333		8.33	118.035
118.0417		8.33	118.040
118.0500		25	118.050
118.0500	A	25	118.051
118.0500	B	25	118.052
118.0500	C	25	118.053
118.0500	D	25	118.054
118.0500		8.33	118.055
118.0583		8.33	118.060
118.0667		8.33	118.065
118.0750	A	25	118.071
118.0750	B	25	118.072
118.0750	C	25	118.073
118.0750	D	25	118.074
118.0750		25	118.075
118.0750		8.33	118.080
118.0833		8.33	118.085
118.0917		8.33	118.090
118.1000		25	118.100
etc.			

* Time slot indication is for VDL Mode 3 channels. (Ref. Annex 10,
Volume III, Part I, Chapter 6 for characteristics of VDL Mode 3 operation)

4.1.3 Frequencies used for particular functions

4.1.3.1 *Emergency channel*

4.1.3.1.1 The emergency channel (121.5 MHz) shall be used only for genuine emergency purposes, as broadly outlined in the following:

- a) To provide a clear channel between aircraft in distress or emergency and a ground station when the normal channels are being utilized for other aircraft;

- b) To provide a VHF communication channel between aircraft and aerodromes, not normally used by international air services, in case of an emergency condition arising;
- c) to provide a common VHF communication channel between aircraft, either civil or military, and between such aircraft, and surface services, involved in common search and rescue operations, prior to changing when necessary to the appropriate frequency;
- d) To provide air-ground communication with aircraft when airborne equipment failure prevents the use of the regular channels;
- e) To provide a channel for the operation of emergency locator transmitters (ELTs), and for communication between survival craft and aircraft engaged in search and rescue operations;
- f) To provide a common VHF channel for communication between civil aircraft and intercepting aircraft or intercept control units and between civil or intercepting aircraft and air traffic services units in the event of interception of the civil aircraft.

Note 1 – The use of the frequency 121.5 MHz for the purpose outlined in c) is to be avoided if it interferes in any way with the efficient handling of distress traffic.

Note 2 – The current Radio Regulations make provisions that the aeronautical emergency frequency 121.5 MHz may also be used by mobile stations of the maritime mobile service, using A3E emission to communicate on this frequency for safety purposes with stations of the aeronautical mobile service (RR S5.200 and Appendix S13, Part A2).

4.1.3.1.2 The frequency 121.5 MHz shall be provided at:

- a) All area control centres and flight information centres;
- b) Aerodrome control towers and approach control offices serving international aerodromes and international alternate aerodromes; and
- c) Any additional location designated by the appropriate ATS authority, where the provision of that frequency is considered necessary to ensure immediate reception of distress calls or to serve the purposes specified in 4.1.3.1.1.

Note – Where two or more of the above facilities are collocated, provision of 121.5 MHz at one would meet the requirement.

4.1.3.1.3 The frequency 121.5 MHz shall be available to intercept control units where considered necessary for the purpose specified in 4.1.3.1.1 f).

4.1.3.1.4 The emergency channel shall be guarded continuously during the hours of service of the units at which it is installed.

4.1.3.1.5 The emergency channel shall be guarded on a single channel simplex operation basis.

4.1.3.1.6 The emergency channel (121.5 MHz) shall be available only with the characteristics as contained in IS 040, Chapter 2.

4.1.3.2 *Air-to-air communications channel*

4.1.3.2.1 An air-to-air VHF communications channel on the frequency of 123.45 MHz shall be designated to enable aircraft engaged in flights over remote and oceanic areas out of range of VHF ground stations to exchange necessary operational information and to facilitate the resolution of operational problems.

Note – Use of the air-to-air channel can cause interference to and from aircraft using the same frequency for air-ground communications.

4.1.3.2.2 In remote and oceanic areas out of range of VHF ground stations, the air-to-air VHF communications channel on the frequency 123.45 MHz shall be available only with the characteristics as contained in IS 040, Chapter 2.

4.1.3.3 Common signaling channel for VDL

4.1.3.3.1 *Common signalling channel VDL Mode 2*-The frequency 136.975 MHz is reserved on a worldwide basis to provide a common signaling channel (CSC) to the VHF digital link (VDL). This CSC uses the Mode 2 VDL modulation scheme and carrier senses multiple accesses (CSMA).

4.1.3.3.2 *Common signalling channels VDL Mode 4*. In areas where VDL Mode 4 is implemented, the frequencies 136.925 MHz and 113.250 MHz shall be provided as common signalling channels (CSCs) to the VHF digital link Mode 4 (VDL Mode 4). These CSCs use the VDL Mode 4 modulation scheme.

4.1.3.4 Auxiliary frequencies for search and rescue operations

4.1.3.4.1 Where a requirement is established for the use of a frequency auxiliary to 121.5MHz, as described in 4.1.3.1.1 c), the frequency 123.1 MHz shall be used.

4.1.3.4.2 The auxiliary search and rescue channel (123.1 MHz) shall be available only with the characteristics as contained in IS 040, Chapter 2.

4.1.4 Provisions concerning the deployment of VHF frequencies and the avoidance of harmful interference

Note - In this section, the protected service volume of each facility is meant in the sense of avoidance of harmful interference

4.1.4.1. The geographical separation between facilities operating on the same frequency shall, except where there is an operational requirement for the use of common frequencies for groups of facilities, be such that the protected service volume of one facility is separated from the protected service volume of another facility by a distance not less than that required to provide a desired to undesired signal ratio of 20 dB or by a separation distance not less than the sum of the distances to the associated radio horizon of each service volume, whichever is smaller.

4.1.4.2 For areas where frequency assignment congestion is severe or is anticipated to become severe, the geographical separation between facilities operating on the same frequency shall, except where there is an operational requirement for the use of common frequencies for groups of facilities, be such that the protected service volume of one facility is separated from the protected service volume of another facility by a distance not less than

that required to provide a desired to undesired signal ratio of 14 dB or by a separation distance not less than the sum of the distances to the associated radio horizon of each service volume, whichever is smaller. This provision shall be implemented on the basis of a regional air navigation agreement.

Note 1 - Guidance material relating to the establishment of the minimum separation distance based on the desired to undesired signal protection ratio of 20 dB or 14 dB and radio line-of-sight is contained in Volume II of the Handbook on Radio Frequency Spectrum Requirements for Civil Aviation including statement of approved ICAO policies (Doc 9718).

Note 2 - The application of the minimum separation distance based on the sum of the radio horizon distance of each facility assumes that it is highly unlikely that two aircraft will be at the closest points between and at the maximum altitude of the protected service volume of each facility.

Note 3 – The distance to the radio horizon from a station in an aircraft is normally given by the formula:

$$D = K \sqrt{h}$$

Where D = distance in nautical miles;

h = height of the aircraft station above earth;

K = (corresponding to an effective earth's radius of 4/3 of the actual radius);

= 2.22 when h is expressed in metres; and

= 1.23 when h is expressed in feet.

Note 4 – In calculating the radio line-of-sight distance between a ground station and an aircraft station, the distance from the radio horizon of the aircraft station computed from Note 1 must be added to the distance from the radio horizon of the ground station. In calculating the latter the same formula is employed, taking for h the height of the ground station transmitting antenna.

Note 5 – The criterion contained in 4.1.5.2 is applicable in establishing minimum geographical separation between VHF facilities, with the object of avoiding co-channel air-to-air interference.

4.1.4.3 The geographical separation between facilities working on adjacent channels shall be such that points at the protection heights and at the limit of the functional service range of each facility are separated by a distance sufficient to ensure operations free from harmful interference.

4.1.4.4 The protection height shall be a height above a specified datum associated with a particular facility, such that below it harmful interference is improbable.

4.1.4.5 The protection height to be applied to functions or to specific facilities shall be determined regionally, taking into consideration the following factors:

- a) The nature of the service to be provided
- b) The air traffic pattern involved
- c) The distribution of communication traffic;
- d) The availability of frequency channels in airborne equipment;
- e) Probable future developments.

4.1.4.6 Where the protected service volume heights is less than those operationally desirable, separation between facilities operating on the same frequency should not be less than that necessary to ensure that an aircraft at the limit of the functional service range and the operationally desirable protection height of one facility does not come above the radio horizon with respect to adjacent facilities.

Note – The effect of this recommendation is to establish a geographical separation distance below which harmful interference is probable.

4.1.4.7 The geographical separation between VHF VOLMET stations shall be determined regionally and shall be such that operations free from harmful interference are secured throughout the protected service volume of each VOLMET station.

4.1.4.8 In the frequency band 117.975 – 137.000 MHz, the frequencies used for National Aeronautical Mobile Services, unless worldwide or regionally allotted to this specific purpose, shall be so deployed that no harmful interference is caused to facilities in the International Aeronautical Mobile Services

4.1.4.9 The problem of inter-State interference should be resolved by consultation between the States concerned.

4.1.4.10 The communication coverage provided by a VHF ground transmitter shall, in order to avoid harmful interference to other stations, be kept to the minimum consistent with the operational requirement for the function.

4.1.5 Method of operation

4.1.5.1 Single channel simplex operation shall be used in the frequency band 117.975 – 137.000 MHz at all stations providing service for aircraft engaged in international air navigation.

4.1.5.2 In addition to the above, the ground-to-air voice channel associated with an ICAO standard radio navigation aid may be used, subject to regional agreement, for broadcast or communication purposes or both.

4.1.6 Plan of assignable VHF radio frequencies for use in the international aeronautical mobile service

4.1.6.1 The frequencies in the frequency band 117.975 – 137.000 MHz for use in the aeronautical mobile (R) service shall be selected from the lists in 4.1.6.1.1.

Note 1- The frequencies 136.500 – 136.975 MHz inclusive are not available for assignment to channels of less than 25 kHz width.

Note 2- Services that continue operation using 25 kHz assignments will be protected in regions implementing 8.33 kHz channel spacing.

4.1.6.1.1 List of assignable frequencies:

List A — assignable frequencies in regions or areas where 25 kHz frequency assignments are deployed:

118.000 – 121.450 MHz in 25 kHz steps

121.550 – 123.050 MHz in 25 kHz steps

123.150 – 136.975 MHz in 25 kHz steps

List B — assignable frequencies in regions or areas where 8.33 kHz frequency assignments are deployed:

118.000 – 121.450 MHz in 8.33 kHz steps

121.550 – 123.050 MHz in 8.33 kHz steps

123.150 – 136.475 MHz in 8.33 kHz steps

4.1.6.1.2 Frequencies for operational control communications may be required to enable aircraft operating agencies to meet the obligations prescribed in Annex 6, Part I, in which case they should be selected from a dedicated band which is determined regionally.

Note- It is recognized that the assignment of such frequencies and the licensing of the operation of the related facilities are matters for national determination. However, in regions where a problem exists with respect to the provision of frequencies for operational control purposes, it may be advantageous if States endeavour to coordinate the requirements of aircraft operating agencies for such channels prior to regional meetings.

4.1.6.2 The frequencies that may be allotted for use in the aeronautical mobile (R) service in a particular region shall be limited to the number determined as being necessary for operational needs in the region.

4.2 UTILIZATION IN THE FREQUENCY BAND 108 – 117.975 MHZ

4.2.1 The block allotment of the frequency band 108 – 117.975 MHz shall be as follows:

— *Band 108 – 111.975 MHz:*

a) ILS in accordance with 4.2.2 and IS 034, 3.1.3;

b) VOR provided that:

1) no harmful adjacent channel interference is caused to ILS;

2) only frequencies ending in either even tenths or even tenths plus a twentieth of a megahertz are used.

c) GNSS ground-based augmentation system (GBAS) in accordance with Annex 10, Volume I, 3.7.3.5, provided that no harmful interference is caused to ILS and VOR.

— *Band 111.975 – 117.975 MHz:*

a) VOR;

b) GNSS ground-based augmentation system (GBAS), provided that no harmful interference is caused to VOR.

4.2.2 For regional assignment planning, the frequencies for ILS facilities shall be selected in the following order:

a) Localizer channels ending in odd tenths of a megahertz and their associated glide path channels;

b) Localizer channels ending in odd tenths plus a twentieth of a megahertz and their associated glide path channels.

4.2.2.1 ILS channels identified by localizer frequencies ending in an odd tenth plus one twentieth of a megahertz in the band 108 – 111.975 MHz shall be permitted to be utilized on the basis of regional agreement when they become applicable in accordance with the following:

- a) for restricted use commencing 1 January 1973;
- b) for general use on or after 1 January 1976.

Note – See Note to 4.2.3.1.

4.2.3 For regional assignment planning, the frequencies for VOR facilities shall be selected in the following order:

- a) frequencies ending in odd tenths of a megahertz in the band 111.975 – 117.975 MHz;
- b) frequencies ending in even tenths of a megahertz in the band 111.975 – 117.975 MHz;
- c) frequencies ending in even tenths of a megahertz in the band 108 – 111.975 MHz;
- d) frequencies ending in 50 kHz in the band 111.975 – 117.975 MHz, except as provided in 4.2.3.1;
- e) frequencies ending in even tenths plus a twentieth of a megahertz in the band 108 – 111.975 MHz except as provided in 4.2.3.1

4.2.3.1 Frequencies for VOR facilities ending in even tenths plus a twentieth of a megahertz in the band 108 – 111.975 MHz and all frequencies ending in 50 kHz in the band 111.975 – 117.975 MHz shall be permitted to be utilized on the basis of a regional agreement when they have become applicable in accordance with the following:

- a) In the band 111.975 – 117.975 MHz for restricted use;
- b) for general use in the band 111.975 – 117.975 MHz at a date fixed by the Council but at least one year after the approval of the regional agreement concerned;
- c) for general use in the band 108 – 111.975 MHz at a date fixed by the Council but giving a period of two years or more after the approval of the regional agreement concerned.

Note - “Restricted use”, where mentioned in 4.2.2.1 a) and 4.2.3.1 a), is intended to refer to the limited use of the frequencies by only suitably equipped aircraft and in such a manner that:

- a) the performance of ILS or VOR equipment not capable of operating on these frequencies will be protected from harmful interference;
- b) a general requirement for the carriage of ILS or VOR airborne equipment capable of operation on these frequencies will not be imposed; and
- c) operational service provided to international operators using 100 kHz airborne equipment is not derogated

4.2.4 To protect the operation of airborne equipment during the initial stages of deploying VORs utilizing 50 kHz channel spacing in an area where the existing facilities may not fully conform with the Standards in IS 034, Chapter 3, all existing VORs within interference range of a facility utilizing 50 kHz channel spacing shall be modified to comply with the provisions of IS 034, 3.3.5.7.

4.2.5 Frequency deployment – The geographical separation between facilities operating on the same and adjacent frequencies shall be determined regionally and shall be based on the following criteria:

- a) The required functional service radii of the facilities;
- b) The maximum flight altitude of the aircraft using the facilities;
- c) The desirability of keeping the minimum IFR altitude as low as the terrain will permit.

4.2.6 To alleviate frequency congestion problems at locations where two separate ILS facilities serve opposite ends of the same runway or different runways at the same airport, the assignment of identical

ILS localizer and glide path paired frequencies should be permitted, provided that:

- a) the operational circumstances permit;
- b) each localizer is assigned a different identification signal; and
- c) arrangements are made whereby the localizer and glide path not in operational use cannot radiate.

Note – The Standards in ASN 114, 3.1.2.7.2 and 3.1.3.9, specify the equipment arrangements to be made.

4.3 UTILIZATION IN THE FREQUENCY BAND 960 – 1 215 MHZ FOR DME

4.3.1 DME operating channels bearing the suffix “X” or “Y” in Table A, Chapter 3 IS 034, shall be chosen on a general basis without restriction.

4.3.2 DME channels bearing the suffix “W” or “Z” in Table A, Chapter 3 of IS 034, shall be chosen on the basis of regional agreement when they become applicable in accordance with the following:

- a) for restricted regional use on or after, whichever is the later:
 - 1) 1 January 1989; or
 - 2) a date prescribed by the Council giving a period of two years or more following approval of the regional agreement concerned;
- b) for general use on or after, whichever is the later:
 - 1) 1 January 1995; or
 - 2) a date prescribed by the Council giving a period of two years or more following approval of the regional agreement concerned.

Note - “Restricted use” is intended to refer to the limited use of the channel by only suitably equipped aircraft and in such a manner that:

- a) the performance of existing DME equipment not capable of operating on these multiplexed channels will be protected from harmful interference;
- b) a general requirement for the carriage of DME airborne equipment capable of operating on these multiplexed channels will not be imposed; and
- c) operational service provided to international operators using existing DME equipment without the multiplexed channel capability is not derogated.

4.3.3 For regional assignment planning, the channels for DME associated with MLS shall be selected from Table 4-2.

4.3.3.1 *Groups 1 to 5.* These DME channels shall be permitted to be used generally. In selecting channels for assignment purposes, the following rules are applicable:

- a) when an MLS/DME is intended to operate on a runway in association with an ILS, the DME channel, if possible, shall be selected from Group 1 or 2 and paired with the ILS frequency as indicated in the DME channelling and pairing table in Table A of IS 034, Chapter 3. In cases where the composite frequency protection cannot be satisfied for all three components, the MLS channel may be selected from Group 3, 4 or 5;
- b) when an MLS/DME is intended to operate on a runway without the coexistence of an ILS,

the DME channel to be used shall preferably be selected from Group 3, 4 or 5.

4.3.3.2 Groups 6 to 10 – These DME channels shall be permitted to be used on the basis of a regional agreement when they have become applicable in accordance with the conditions specified at 4.3.2.

4.3.4 Coordination of regional DME channel assignments should be effected through ICAO.

Table 4-2

<i>Group</i>	<i>DME channels</i>	<i>Associated paired VHF channels</i>	<i>Remarks</i>	<i>Assignment procedure</i>
1	EVEN 18X to 56X	ILS 100 kHz spacings	Would normally be used if a single DME is paired with ILS and is part of MLS	for general use (see 4.3.1)
2	EVEN 18Y to 56Y	ILS 50 kHz spacings		
3	EVEN 80Y to 118Y	VOR 50 kHz spacings Odd tenths of a MHz		
4	ODD 17Y to 55Y	VOR 50 kHz spacings		
5	ODD 81Y to 119Y	VOR 50 kHz spacings Even tenths of a MHz		
6	EVEN 18W to 56W	No associated paired VHF channel	for later use (see 4.3.2)	
7	EVEN 18Z to 56Z	No associated paired VHF channel		
8	EVEN 80Z to 118Z	No associated paired VHF channel		
9	ODD 17Z to 55Z	No associated paired VHF channel		
10	ODD 81Z to 119Z	No associated paired VHF channel		

Note. — DME channels in Groups 1 and 2 may be used in association with ILS and/or MLS. DME channels in Groups 3, 4 and 5 may be used in association with VOR or MLS.

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Frequency (MHz)	Annotations	Frequency (MHz)	Annotations
121.5	Emergency frequency	121.95	Reserved for aerodrome surface communications [see Table 4-1, Item c)]
123.1	Auxiliary frequency SAR	121.625	
121.60	Reserved for aerodrome surface communications [see Table 4-1, Item c)]	121.675	
121.65		121.725	
121.70		121.775	
121.75		121.825	
121.80		121.875	
121.85		121.925	
121.90		121.975	

GROUP A
Frequencies (MHz)

118.00	118.90	119.80	120.70	123.80	124.70	125.60	126.50	127.40	128.30	129.20	131.20
118.10	119.00	119.90	120.80	123.90	124.80	125.70	126.60	127.50	128.40	129.30	131.30
118.20	119.10	120.00	120.90	124.00	124.90	125.80	126.70	127.60	128.50	129.40	131.40
118.30	119.20	120.10	121.00	124.10	125.00	125.90	126.80	127.70	128.60	129.50	131.50
118.40	119.30	120.20	121.10	124.20	125.10	126.00	126.90	127.80	128.70	129.60	131.60
118.50	119.40	120.30	121.20	124.30	125.20	126.10	127.00	127.90	128.80	130.90	131.70
118.60	119.50	120.40	121.30	124.40	125.30	126.20	127.10	128.00	128.90	131.00	131.80
118.70	119.60	120.50	121.40	124.50	125.40	126.30	127.20	128.10	129.00	131.10	131.90
118.80	119.70	120.60	123.70	124.60	125.50	126.40	127.30	128.20	129.10		

GROUP B
Frequencies (MHz)

118.05	118.95	119.85	120.75	123.95	124.85	125.75	126.65	127.55	128.45	129.25	131.25
118.15	119.05	119.95	120.85	124.05	124.95	125.85	126.75	127.65	128.55	129.35	131.35
118.25	119.15	120.05	120.95	124.15	125.05	125.95	126.85	127.75	128.65	129.45	131.45
118.35	119.25	120.15	121.05	124.25	125.15	126.05	126.95	127.85	128.75	129.55	131.55
118.45	119.35	120.25	121.15	124.35	125.25	126.15	127.05	127.95	128.85	129.65	131.65
118.55	119.45	120.35	121.25	124.45	125.35	126.25	127.15	128.05	128.95	130.95	131.75
118.65	119.55	120.45	121.35	124.55	125.45	126.35	127.25	128.15	129.05	131.05	131.85
118.75	119.65	120.55	123.75	124.65	125.55	126.45	127.35	128.25	129.15	131.15	131.95
118.85	119.75	120.65	123.85	124.75	125.65	126.55	127.45	128.35			

GROUP C
Frequencies (MHz)

132.00	132.35	132.70	133.05	133.40	133.75	134.10	134.45	134.80	135.10	135.40	135.70
132.05	132.40	132.75	133.10	133.45	133.80	134.15	134.50	134.85	135.15	135.45	135.75
132.10	132.45	132.80	133.15	133.50	133.85	134.20	134.55	134.90	135.20	135.50	135.80
132.15	132.50	132.85	133.20	133.55	133.90	134.25	134.60	134.95	135.25	135.55	135.85
132.20	132.55	132.90	133.25	133.60	133.95	134.30	134.65	135.00	135.30	135.60	135.90
132.25	132.60	132.95	133.30	133.65	134.00	134.35	134.70	135.05	135.35	135.65	135.95
132.30	132.65	133.00	133.35	133.70	134.05	134.40	134.75				

GROUP D
Frequencies (MHz)

132.025	132.525	133.025	133.525	134.025	134.525	135.025	135.525	136.000	136.250	136.500	136.750
132.075	132.575	133.075	133.575	134.075	134.575	135.075	135.575	136.025	136.275	136.525	136.775
132.125	132.625	133.125	133.625	134.125	134.625	135.125	135.625	136.050	136.300	136.550	136.800
132.175	132.675	133.175	133.675	134.175	134.675	135.175	135.675	136.075	136.325	136.575	136.825
132.225	132.725	133.225	133.725	134.225	134.725	135.225	135.725	136.100	136.350	136.600	136.850
132.275	132.775	133.275	133.775	134.275	134.775	135.275	135.775	136.125	136.375	136.625	136.875
132.325	132.825	133.325	133.825	134.325	134.825	135.325	135.825	136.150	136.400	136.650	136.900
132.375	132.875	133.375	133.875	134.375	134.875	135.375	135.875	136.175	136.425	136.675	136.925
132.425	132.925	133.425	133.925	134.425	134.925	135.425	135.925	136.200	136.450	136.700	136.950
132.475	132.975	133.475	133.975	134.475	134.975	135.475	135.975	136.225	136.475	136.725	136.975