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| **SADC AVIATION SAFETY ORGANIZATION (SASO)****REGULATIONS** |



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| **COMMUNICATION, NAVIGATION & SURVEILLACE****PART V****AERONAUTICAL RADIO FREQUENCY SPECTRUM UTILIZATION****First Edition****April 2023** |

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# RECORD OF REVISIONS

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# PRELIMINARY PROVISIONS

## Citation and commencement

1. These Regulations may be cited as the SASO Model Civil Aviation (Aeronautical Radio Frequency Spectrum Utilization) Regulations, 2023
2. These regulations come into operation on the date on which it is published in the [State] Gazette.

## Application

1. These Regulations shall apply to a person or organization providing Communication, Navigation and Surveillance services within designated air spaces and at aerodromes.

## Definitions

1. When the following terms are used in this volume, they have the following meanings:
2. ***Alternative means of communication.*** A means of communication provided with equal status, and in addition to the primary means.
3. ***Double channel simplex.*** Simplex using two frequency channels, one in each direction.
4. ***Duplex.*** A method in which telecommunication between two stations can take place in both directions simultaneously.
5. ***Frequency channel.*** A continuous portion of the frequency spectrum appropriate for a transmission utilizing a specified class of emission.
6. ***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.
7. ***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.
8. ***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.
9. ***Simplex.*** A method in which telecommunication between two stations takes place in one direction at a time.
10. ***Single channel simplex.*** Simplex using the same frequency channel in each direction.
11. ***VHF digital link (VDL).*** A constituent mobile subnetwork 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.

# DISTRESS FREQUENCIES

1. Frequencies for emergency locator transmitters (ELTS) for search and rescue
2. All emergency locator transmitters carried in compliance with Standards of Annex 6, Parts I, II and III shall operate on both 406 MHz and 121.5 MHz.
3. Search and rescue frequencies
4. 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.
5. Where specific frequencies are required for communication between rescue coordination centres and aircraft engaged in search and rescue operations, they shall 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.

# UTILIZATION OF FREQUENCIES BELOW 30 MHz

1. Method of operations
2. In the aeronautical mobile service, single channel simplex shall be used in radiotelephone communications utilizing radio frequencies below 30 MHz in the bands allocated exclusively to the aeronautical mobile (R) service.
3. Assignment of single sideband channels
4. Single sideband channels shall be assigned in accordance with the Civil Aviation (Communication Systems) Regulations.
5. For the operational use of the channels concerned administrations shall take into account the provisions of 27/19 of Appendix 27 of the ITU Radio Regulations.
6. The use of aeronautical mobile (R) frequencies below 30 MHz for international operations shall be coordinated as specified in Appendix S27 of the ITU Radio Regulations as follows:

27/19 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.

1. Where international operating requirements for HF communications cannot be satisfied by the Frequency Allotment Plan at Part 2 of Appendix 27 to the Radio Regulations, an appropriate frequency shall be assigned as specified in Appendix 27 by the application of the following provisions:

27/20 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.

27/21 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.

27/22 The co-ordination described in No. 27/19 shall be effected where appropriate and desirable for the efficient utilization of the frequencies in question, and especially when the procedures of No. 27/21 are unsatisfactory.

1. The use of classes of emission J7B and J9B shall be subject to the following provisions of Appendix 27:

27/12 For radiotelephone emissions the audio frequencies will be limited to between 300 and 2 700 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. 27/73 and 27/74).

27/14 On account of the possibility of interference, a given channel should not be used in the same allotment area for radiotelephony and data transmissions.

27/15 The use of channels derived from the frequencies indicated in 27/18 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.

1. NDB frequency management
2. NDB frequency management shall take into account the following:
3. the interference protection required at the edge of the rated coverage;
4. the application of the figures shown for typical ADF equipment;
5. the geographical spacings and the respective rated coverages;
6. the possibility of interference from spurious radiation generated by non-aeronautical sources (e.g. electric power services, power line communication systems, industrial radiation, etc.).
7. 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 shall be permitted, and the assignment of a common frequency to both of the inner locators shall be permitted, provided that:
8. the operational circumstances permit;
9. each locator is assigned a different identification signal; and
10. arrangements are made whereby locators using the same frequency cannot radiate simultaneously.

**UTILIZATION OF FREQUENCIES ABOVE 30 MHz**

1. Utilization in the Band 117.975 – 137.000 MHz
2. The block allotment of the frequency band 117.975 – 137.000 MHz shall be as shown in Table 4-1.

**Table 4-1. Allotment table**

****

1. Frequency separation and limits of assignable frequencies
2. In the frequency band 117.975 – 137.000 MHz, the lowest assignable frequency shall be 118.000 MHz and the highest 136.975 MHz
3. The minimum separation between assignable frequencies in the aeronautical mobile (R) service shall be 8.33 kHz.
4. 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.
5. Requirements for mandatory carriage of equipment specifically designed for VDL Mode 2, 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.
6. The agreement indicated in CNS V 005(a)(4) shall provide at least two years’ notice of mandatory carriage of airborne systems.
7. 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).



1. Frequencies used for particular functions
2. Emergency channel
3. The emergency channel (121.500 MHz) shall be used only for genuine emergency purposes, as broadly outlined in the following:
4. 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;
5. to provide a VHF communication channel between aircraft and aerodromes, not normally used by international air services, in case of an emergency condition arising;
6. 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;
7. to provide air-ground communication with aircraft when airborne equipment failure prevents the use of the regular channels;
8. 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;
9. 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.
10. **The frequency 121.500 MHz shall be provided at:**
11. all area control centres and flight information centres;
12. aerodrome control towers and approach control offices serving international aerodromes and international alternate aerodromes; and
13. 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 CNS V 005(c)(1)(i).
14. The frequency 121.500 MHz shall be available to intercept control units were considered necessary for the purpose specified in CNS V 005(c)(1)(i)(D).
15. The emergency channel shall be guarded continuously during the hours of service of the units at which it is installed.
16. The emergency channel shall be guarded on a single channel simplex operation basis.
17. The emergency channel (121.500 MHz) shall be available only with the characteristics as contained in Civil Aviation (Communication Systems) Regulations.
18. Air-to-air communications channel
19. An air-to-air VHF communications channel on the frequency of 123.450 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.
20. In remote and oceanic areas out of range of VHF ground stations, the air-to-air VHF communications channel on the frequency 123.450 MHz shall be available only with the characteristics as contained in Civil Aviation (Communication Systems) Regulations.
21. *Common signalling channels for VDL*
22. Common signalling channel VDL Mode 2. The frequency 136.975 MHz is reserved on a worldwide basis to provide a common signalling channel (CSC) to the VHF digital link Mode 2 (VDL Mode 2). This CSC uses the Mode 2 VDL modulation scheme and carrier sense multiple access (CSMA).
23. *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.
24. **Auxiliary frequencies for search and rescue operations**
25. Where a requirement is established for the use of a frequency auxiliary to 121.500 MHz, as described in CNS V 005(c)(1)(i)(C), the frequency 123.100 MHz shall be used.
26. The auxiliary search and rescue channel (123.100 MHz) shall be available only with the characteristics as contained in Civil Aviation (Communication Systems) Regulations.
27. provisions concerning the deployment of VHF frequencies and the avoidance of harmful interference
28. 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 each facility is separated from the protected service volume of the other 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 associated radio horizon of each service volume, whichever is smaller.
29. 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 each facility is separated from the protected service volume of the other 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.
30. The geographical separation between facilities operating on adjacent channels shall be such that points at the edge of the protected service volume of each facility are separated by a distance sufficient to ensure operations free from harmful interference.

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

1. The protection height to be applied to functions or to specific facilities shall be determined regionally, taking into consideration the following factors:
2. the nature of the service to be provided;
3. the air traffic pattern involved;
4. the distribution of communication traffic;
5. the availability of frequency channels in airborne equipment;
6. probable future developments.
7. Where the protected service volume is less than operationally desirable, separation between facilities operating on the same frequency shall not be less than that necessary to ensure that an aircraft at the upper edge of the operational service volume of one facility does not come above the radio horizon with respect to emissions belonging to the service of adjacent facilities.
8. 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
9. 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.
10. The problem of inter-State interference shall be resolved by consultation between the States concerned.
11. 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.
12. Method of operation
13. Single channel simplex operation shall be used in the frequency band 117.975 – 137 MHz at all stations providing service for aircraft engaged in international air navigation.
14. In addition to the above, the ground-to-air voice channel associated with a standard radio navigational aid may be used, subject to regional agreement, for broadcast or communication purposes or both.
15. Plan of assignable VHF radio frequencies for use in the international aeronautical mobile service
16. The frequencies in the band 117.975 – 137.000 MHz for use in the aeronautical mobile (R) service shall be selected from the lists in CNS V 005(f)(1)(ii).
17. 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

118.00 – 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

1. Frequencies for operational control communications shall be required to enable aircraft operating agencies to meet the obligations prescribed in Civil Aviation (Operation of Aircraft) Regulations, in which case they shall be selected from a dedicated band which is determined regionally.
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.
3. Utilization in the Band 108 – 117.975 MHz
4. The block allotment of the frequency band 108 – 117.975 MHz shall be as follows:

 **Band 108 – 111.975 MHz:**

1. ILS;
2. VOR provided that:
3. no harmful adjacent channel interference is caused to ILS;
4. only frequencies ending in either *even tenths* or *even tenths plus a twentieth* of a megahertz are used.
5. GNSS ground-based augmentation system (GBAS) in accordance with Civil Aviation (Radio Navigation Aids) Regulations, provided that no harmful interference is caused to ILS and VOR.

**Band 111.975 – 117.975 MHz:**

1. VOR;
2. GNSS ground-based augmentation system (GBAS) in accordance with Civil Aviation (Radio Navigation Aids) Regulations provided that no harmful interference is caused to VOR.
3. For regional assignment planning, the frequencies for ILS facilities shall be selected in the following order:
4. localizer channels ending in *odd tenths* of a megahertz and their associated glide path channels;
5. localizer channels ending in *odd tenths plus a twentieth* of a megahertz and their associated glide path channels.

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:

1. for restricted use commencing 1 January 1973;
2. for general use on or after 1 January 1976.
3. For regional assignment planning, the frequencies for VOR facilities shall be selected in the following order:
4. frequencies ending in odd tenths of a megahertz in the band 111.975 – 117.975 MHz;
5. frequencies ending in even tenths of a megahertz in the band 111.975 – 117.975 MHz;
6. frequencies ending in even tenths of a megahertz in the band 108 – 111.975 MHz;
7. frequencies ending in 50 kHz in the band 111.975 – 117.975 MHz, except as provided in 4.2.3(a);
8. frequencies ending in even tenths plus a twentieth of a megahertz in the band 108 – 111.975 MHz except as provided in CNS V 006(c)(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:

1. in the band 111.975 – 117.975 MHz for restricted use;
2. 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;
3. 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.
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 Civil Aviation (Radio Navigation Aids) Regulations, all existing VORs within interference range of a facility utilizing 50 kHz channel spacing shall be modified to comply with the provisions of Civil Aviation (Radio Navigation Aids) Regulations.
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:
6. the required functional service radii of the facilities;
7. the maximum flight altitude of the aircraft using the facilities;
8. the desirability of keeping the minimum IFR altitude as low as the terrain will permit.
9. 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 shall be permitted provided that:
10. the operational circumstances permit;
11. each localizer is assigned a different identification signal; and
12. arrangements are made whereby the localizer and glide path not in operational use cannot radiate.
13. Utilization in the Band 960 – 1 215 MHz FOR DME
14. DME operating channels bearing the suffix “X” or “Y” in Table A, Part III of the Civil Aviation (Radio Navigation Aids) Regulations shall be chosen on a general basis without restriction.
15. DME channels bearing the suffix “W” or “Z” in Table A, Part III of Civil Aviation (Radio Navigation Aids) Regulations, shall be chosen on the basis of regional agreement when they become applicable in accordance with the following:
16. *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:
17. when an 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 Civil Aviation (Radio Navigation Aids) Regulations Part III.
18. when an 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.
19. 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 CNS V 007(b).
20. Coordination of regional DME channel assignments shall be effected through ICAO.

**UTILIZATION OF FREQUENCIES FOR RPAS C2 LINK COMMUNICATION SERVICES**

1. Satellite-based C2 Link systems
2. Satellite-based RPAS C2 Link systems shall operate in the following frequency bands:
3. frequency bands with an appropriate allocation to aeronautical safety services under the aeronautical mobile-satellite (route) service (AMS(R)S). Frequency bands that meet these criteria and can be used for RPAS C2 Links are: 1 610 – 1 626.5 MHz and 5 030 – 5 091 MHz;
4. frequency bands with an allocation to aeronautical safety services under the mobile-satellite service (MSS) where AMS(R)S operations have priority access. Frequency bands that meet these criteria and can be used for RPAS C2 Links are: 1 545 – 1 555 MHz and 1 646.5 – 1 656.5MHz;
5. frequency bands with an allocation to the fixed satellite service (FSS) where the conditions in ITU Resolution 155 (WRC-15) are met. Frequency bands in which this resolution applies are:

— 10.95 – 11.2 GHz (space-to-Earth);

— 11.45 – 11.7 GHz (space-to-Earth);

— 11.7 – 12.2 GHz (space-to-Earth) in Region 2;

— 12.2 – 12.5 GHz (space-to-Earth) in Region 3;

— 12.5 – 12.75 GHz (space-to-Earth) in Regions 1 and 3;

— 19.7 – 20.2 GHz (space-to-Earth);

— 14.0 – 14.47 GHz (Earth-to-space); and

— 29.5 – 30.0 GHz (Earth-to-space) with an ITU satellite earth station class of “UG”.

1. RPA and RPS earth stations shall operate within the notified and recorded technical parameters of the associated satellite network, including specific or typical earth stations as published by the ITU.
2. RPA and RPS earth stations operating in accordance with CNS V 0012(a)(3) shall use FSS assignments that have been successfully coordinated under Article 9 of the ITU Radio Regulations and recorded in the Master International Frequency Register (MIFR) with a favourable finding under Article 11 of the ITU Radio Regulations including Nos. 11.31, 11.32 or 11.32A where applicable, and except those assignments that have not successfully completed coordination procedures under No. 11.32 by applying Appendix 5 paragraph 6.d.i of the ITU Radio Regulations.
3. Terrestrial C2 Link Communication Systems
4. Terrestrial RPAS C2 Link systems shall operate in bands allocated to the Aeronautical Mobile (Route) Service (AM(R)S). Suitable frequencies or frequency bands with such allocations include 113.250 MHz and 136.925 MHz (common signalling frequencies for VDL Mode 4), 960-1164 MHz and 5030-5091 MHz. The operation of the C2 Link within any of these bands shall be determined on the basis of regional air navigation agreements.