



International Civil Aviation Organization

MIDANPIRG/20 and RASG-MID/10 Meetings

(Muscat, Oman, 14-17 May 2023)

Agenda Item 6.6: CNS

SPECTRUM MANAGEMENT

(Presented by the Secretariat)

SUMMARY

This paper presents the latest work, enhancements and functionalities brought to the Frequency Finder tool to assist ICAO Regional Offices and States to manage and coordinate aeronautical frequency assignments a

Action by the meeting is at paragraph 3.

REFERENCES

- ICAO Assembly 41 Resolution A41-8
- MIDANPIRG/19 Report
- ACAO/ICAO Frequency Management Workshop SOD (6-10 June 2022)

1. INTRODUCTION

1.1 The latest revisions of the Handbook on Radio Frequency Spectrum Requirement for Civil Aviation (Doc 9718), Volume I and Volume II, which have been approved by the Secretary General for publication, were formally published in early 2022.

2. DISCUSSION

Enhancement of the FF Tool use

2.1 Frequency Finder (FF) is a program for managing, assessing compatibility and presenting frequency assignments for aeronautical communication and navigation systems as well as for the coordination of SSR Mode S Interrogator Identifier (II) / Surveillance Identifier (SI) codes. ICAO developed the program to offer a tool to assist ICAO Regional Offices and States to manage and coordinate aeronautical frequency assignments.

2.2 The Frequency Finder program currently combines the database management functions for updating the ICAO COM Lists 2 and 3, VHF COM & VHF NAV modules.

2.3 The ACAO/ICAO Frequency Management Workshop was conducted successfully (6-10 June 2022, Casablanca, Morocco). The Workshop recommended that the Frequency Management Working Group (FM WG) should further review and amend, as deemed necessary, the current MID allotment plan as at **Appendix A** (Appendix B-4. Regional frequency allotment plans – ICAO Doc. 9718, Vol. II refers), to increase the amount of spectrum that can be used for ATC Services. The CNS SG/12 meeting supported the recommendation and proposed the following Draft Decision:

Why	To increase the amount of spectrum that can be used for ATC Services
What	To revise the MID Region Allotment plan based on planning principle for aeronautical facilities and services operating in the aeronautical frequency bands of 117.975- 137 MHz
Who	Frequency Management Working Group
When	March 2024

DRAFT DECISION 20/XX: REVIEW OF THE MID REGION ALLOTMENT PLAN

That, in order to increase the amount of spectrum that can be used for ATC Services, the FM WG should adopt the revised planning Principle for Aeronautical Frequency Bands of 117.975-137 MHz and review and update, as deemed necessary, the current MID allotment plan by Q1 2024.

2.4 The increase of the expected VHF spectrum availability and with the expected changes in air traffic, a recommendation was formulated at the ACAO/ICAO Frequency Management workshop, , to conduct a simulation on VHF COM frequency assignment in the MID Region based on the new operational requirements of States to 2030 as necessary. The primary purpose of this simulation is to determine, if a congestion in the use of frequencies can be foreseen that would require the implementation of 8.33 kHz channel spacing in any parts of the MID Region.

2.5 States are therefore requested, to check if all frequency assignments that are in use are also registered in FF. Only frequency assignments in the Frequency COM List 3 can be considered to be protected from harmful interference during future frequency assignment planning activities. The secretariat proposed that **Appendix B** of this WP be used to guide States for any frequency assignment that has not yet been submitted to the MID Regional Office.

2.6 The meeting invites therefore States/Administrations to submit these requirements to the MID Regional Office by 1 August 2023. The analysis will be aimed at determining whether these requirements can be assigned a frequency within the available 25 kHz channels.

2.7 In case not all frequency requirements until 2030 can be satisfied using 25 kHz channels, material for the introduction of 8.33 kHz channel will need to be developed or other viable solution in the MID Region or parts thereof. Based on other Regions' experience, the introduction of 8.33 kHz channel separation would require a retrofit of airborne/ground equipment.

2.8 States should, to the extent possible, use FF to coordinate for all frequency assignments that may affect the use of frequencies in other States. Not doing so, will ultimately result in less efficient and less flexible assignment coordination and planning in a congested environment, ultimately resulting in unforeseen interference. Furthermore, there will little possibility of optimizing assignments to solve congestion, or conducting a meaningful simulation at the regional level.

2.9 Based on all the above, the CNS SG/12 meeting proposed the following Draft Conclusion:

Why	To conduct a simulation for VHF COM frequency assignment based on new operational requirements of States to 2030 as necessary
What	To conduct a simulation for VHF COM frequency assignment based on new operational requirements of States to 2030 as necessary
Who	MID States
When	Before 1 August 2023

DRAFT CONCLUSION 20/XX: OPTIMIZATION OF FREQUENCY ASSIGNMENT IN THE MID REGION

That, in order to optimize the frequency assignment planning and mitigate VHF frequency congestion at regional level, States are urged to:

- a) coordinate with ICAO MID Office before assigning frequencies for aeronautical services (VHF COM, VHF NAV);*
- b) perform an update/review of the data in the VHF-COM/NAV module; and*
- c) Submit Frequency Requirements for the Period 2023 – 2030 using the Guidance Doc. at Appendix B by 1 August 2023.*

World Radio Communication Conference for 2023

2.10 The meeting may wish to recall that the ICAO Assembly 41, through Resolution A41-8, urged States, international organizations and other civil aviation stakeholders to support firmly the ICAO frequency spectrum strategy and the ICAO position at WRCs and in regional and other international activities conducted in preparation for WRCs, including by the following means:

- a) working together to deliver spectrum-efficient aeronautical systems as well as frequency management that meet current “best practices”;
- b) supporting ICAO activities relating to the aviation frequency spectrum strategy and policy through relevant expert group meetings and regional planning groups;
- c) undertaking to provide for aviation interests to be fully integrated in the development of their positions presented to regional telecommunications fora involved in the preparation of joint proposals to the WRC;
- d) including in their proposals to the WRC, to the extent possible, material consistent with the ICAO position;

- e) supporting the ICAO position and the ICAO policy statements at ITU WRCs as approved by Council and incorporated in the Handbook on Radio Frequency Spectrum Requirements for Civil Aviation (Doc 9718);
- f) undertaking to provide civil aviation experts to fully participate in the development of States' and regional positions and development of aviation interests at the ITU; and
- g) ensuring, to the maximum extent possible, that their delegations to regional conferences, ITU study groups and WRCs include experts from their civil aviation authorities and other civil aviation stakeholders who are fully prepared to represent aviation interests;

2.11 The meeting may wish to recall that MIDANPIRG/19 urged States to participate in the WRC23 preparatory activity and to communicate the ICAO WRC-23 position to national Telecommunication Authorities. A WRC23 preparatory Workshop has been coordinated with ICAO FSMP to be conducted back-to-back with the FSMP WG/17 meeting in Cairo, Egypt, 28 August to 7 September 2023.

2.12 The ICAO WRC23 Position, available in Arabic, Chinese, English, French, Russian and Spanish at this link: <https://www.icao.int/safety/fsmp/documents/itu-wrc23> was approved by the ICAO Council and sent to all ICAO Contracting States and relevant international organizations under cover of ICAO State letter E 3/5-21/37 dated 18 August 2021.

2.13 Draft updates to the ICAO Position, as contained in **Appendix C** were developed by the Frequency Spectrum Management Panel (FSMP) of the Air Navigation Commission (ANC) of ICAO. These updates, which include clarifications and refinements to the ICAO Position in line with the outcome of relevant studies within ITU-R and ICAO, will be addressed by the ICAO ANC in May 2023 before their final approval by ICAO Council in June 2023. The final position might include small adjustments.

2.14 It should be highlighted that active support from States is deemed to be the only mean to ensure that the results of the WRC-23 reflect civil aviation's need for spectrum.

2.15 The CNS SG/12 agreed on the need to enhance coordination with the Arab Spectrum management group (ASMG) and Asia-Pacific Telecommunity (APT) for all spectrum matters, therefore, the meeting agreed that the FM WG should include members from TRA and CAA.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) urge States to:
 - i) participate actively in ICAO WRC23 Preparatory Workshop (28-29 August 2023);
 - ii) Implement ICAO Assembly Resolution A41-8;
 - iii) make extensive usage of the Frequency finder tool for frequency coordination; and
 - iv) provide feedback on Frequency Finder tool usage, suggestions, bugs and recommendations; and
- b) endorse the Draft Decision and Conclusion at 2.3 & 2.9.

APPENDIX B

SUBMISSION OF FREQUENCY REQUIREMENTS FOR THE PERIOD 2023 – 2030

1.1 The primary purpose of this simulation is to determine if a congestion in the use of frequencies can be foreseen that would require the implementation of 8.33 kHz channel spacing in any parts of the MID Region.

1.2 With the view to determine the medium-term spectrum requirements for VHF communication services, States are invited to submit these requirements to the MID Regional Office (RO) by 1 August 2023. On the basis of these requirement, the RO will undertake an analysis that is aimed at determining whether these requirements can be assigned a frequency within the available 25 kHz channels.

1.3 In this case, States can introduce the requirements in the local version of Frequency Finder and generate with the button “Export Submissions” an Excel file that can be submitted to the RO.

1.4 States are able to download the Frequency Finder tool from Frequency Spectrum Management Panel (FSMP) webpage at: <https://www.icao.int/safety/FSMP/Pages/Documents.aspx> , and the RO will provide assistance for any difficulties in installation and use of this ICAO tool.

1.5 Precise details not available

1.5.1 When precise details are not available for future frequency requirements, States can submit such requirements in any format.

1.5.2 Example 1: For a new airport, States can submit the (approximate) coordinates and specify the need for:

- x TWR frequencies
- x Aerodrome surface frequencies
- x APP-U frequencies
- x APP-L frequencies
- x ACC-U frequencies
- ATTM.- 2
- x ACC-L frequencies
- x VOLMET frequencies
- x ATIS frequencies
- x VDL frequencies

APPENDIX C

ICAO position for the International Telecommunication Union (ITU)

World Radiocommunication Conference 2023 (WRC-23)

SUMMARY

This paper reviews the agenda for the International Telecommunication Union (ITU) World Radiocommunication Conference 2023 (WRC-23), discusses points of aeronautical interest and provides the ICAO Position for these agenda items.

The goal of the ICAO Position is to ensure aeronautical access to appropriately protected spectrum for radiocommunication and radionavigation systems that support current and future safety-of-flight applications. In particular, it describes the safety considerations necessary to ensure adequate protection against harmful interference.

Support of the ICAO Position by ITU Member States is required to ensure that the position is supported at the WRC-23 and that aviation requirements are met.

- 1) Introduction
- 2) ICAO and the international regulatory framework
- 3) Spectrum requirements for international civil aviation
- 4) Aeronautical aspects on the agenda for WRC-23.

1 Introduction

1.1 The ICAO Position on issues of interest to international civil aviation to be addressed at the 2023 ITU World Radiocommunication Conference (WRC-23) is presented below. The agenda of this Conference is contained in the attachment. The ICAO Position is to be considered in conjunction with sections 7-II and 8 of the Handbook on Radio Frequency Spectrum Requirements for Civil Aviation, Volume I — ICAO spectrum strategy, policy statements and related information (Document 9718, Second Edition, 2018). Document 9718 is available on <http://www.icao.int/safety/fsmp> (see webpage: Documents). It should be noted that the Handbook contains a long-term policy based on a snapshot in time and, as such, it may lag behind the ICAO WRC Position. As a result, when there is conflict between the Handbook and a current ICAO WRC Position, the Position should be seen as being the guiding document.

1.2 ICAO supports the working principle within the ITU, as established during studies for WRC-07, that ICAO will ensure the compatibility of ICAO standard systems with existing or planned aeronautical systems operating in accordance with international aeronautical Standards. Compatibility of ICAO standard

systems with non-ICAO standard aeronautical systems (or non-aeronautical systems) will be addressed in the ITU.

2 ICAO and the International Regulatory Framework

2.1 ICAO is the specialized agency of the United Nations providing for the international regulatory framework for civil aviation. The *Convention on International Civil Aviation* is an international treaty providing required provisions for the safety of flights over the territories of the 193 ICAO Member States and over the high seas. It includes measures to facilitate air navigation, including international Standards and Recommended Practices commonly referred to as SARPs.

2.2 The ICAO Standards constitute the rule of law through the ICAO Convention and form a regulatory framework for aviation, covering personnel licensing, technical requirements for aircraft operations, airworthiness requirements, aerodromes and systems used for the provision of communications, navigation and surveillance, as well as other technical and operational requirements.

3 Spectrum requirements for International Civil Aviation

3.1 Air transport plays a major role in driving sustainable economic and social development worldwide. Since the mid-1970s and until the end of 2019, air traffic growth has consistently defied economic recessionary cycles, expanding two-fold once every 15 years. It is estimated that in 2019 air transport directly and indirectly supported the employment of 87.7 million people, contributing USD 3.5 trillion to the global gross domestic product (GDP), and carried over 4.5 billion passengers and over 52 million tonnes of cargo.

3.2 While the COVID-19 outbreak did significantly impact the global air transport industry, the industry continues to play a critical role in supporting humanity's fight against the global pandemic. The industry contributions have included delivering medical equipment and medicines, supporting traveller repatriations and medical evacuations, and maintaining crucial global supply chains through increased air cargo operations.

3.3 The safety of air operations is dependent on the availability of reliable communication and navigation services. Current and future communication, navigation, and surveillance/air traffic management (CNS/ATM) systems are highly dependent upon the availability of sufficient, suitably protected radio spectrum that can support the high integrity and availability requirements associated with aeronautical safety systems. Spectrum requirements for current and future aeronautical CNS systems are specified in the ICAO Spectrum Strategy¹, as addressed by the Twelfth Air Navigation Conference, and as approved by the ICAO Council.

3.4 In support of the safety aspects related to the use of radio frequency spectrum by aviation:

- Article 40 of the ITU Constitution states, "*international telecommunication services must give absolute priority to all telecommunications concerning safety of life at sea, on land, in the air or in outer space, as well as to epidemiological telecommunications of exceptional urgency of the World Health Organization*".

¹ The ICAO spectrum strategy is included in the ICAO Handbook on Radio Frequency Spectrum Requirements for Civil Aviation, Volume I — ICAO spectrum strategy, policy statements and related information (Document 9718).

- No. 4.10 of the Radio Regulations states, “Member States recognize that the safety aspects of radionavigation and other safety services require special measures to ensure their freedom from harmful interference; it is necessary therefore to take this factor into account in the assignment and use of frequencies.”

In particular, compatibility of aeronautical safety services with co-band or adjacent band aeronautical non-safety services or non-aeronautical services must be considered with extreme care in order to preserve the integrity of the aeronautical safety services.

3.5 The continuous increase in air traffic movements as well as the additional requirement for accommodating new and emerging applications such as unmanned aircraft systems (UAS²) and commercial sub-orbital vehicle flights are placing an increased demand on both the aviation regulatory and air traffic management mechanisms. As a result, the airspace is becoming more complex and the demand for frequency assignments (and consequential spectrum allocations) is increasing. While some of this demand can be met through improved spectral efficiency of existing radio systems in frequency bands currently allocated to aeronautical services, it is inevitable that these frequency bands may need to be increased or additional aviation spectrum allocations may need to be agreed upon to meet this demand.

3.6 In addition, it is noted that there is a general trend toward the development of new terrestrial mobile communications networks with higher radiated power base stations, in particular IMT base stations using active antennas. A review of unwanted emission levels of these stations should be considered to ensure continued compatibility with other systems and services, particularly aviation safety systems.

3.7 The ICAO Position for the ITU WRC-23 was initially developed in 2020 with the assistance of the Frequency Spectrum Management Panel (FSMP) and was reviewed by the Air Navigation Commission at the seventh meeting of its 215th Session on 27 October 2020. Following the review by the Commission, it was submitted to ICAO Contracting States and relevant international organizations for comment. After a further review of the ICAO Position in light of the comments received by the Commission on 29 April 2021, the ICAO Position was reviewed and approved by the ICAO Council on 14 June 2021. [Editorial Note: Update the following when/as appropriate.] Taking into account the results of studies within the ITU and ICAO, the ICAO Position was updated and approved by the ICAO Council on XX June 2023. This document contains that updated ICAO WRC-23 Position

3.8 States and international organizations are requested to make use of the ICAO Position, to the maximum extent possible, in their preparatory activities for the WRC-23 at the national level, in the activities of the regional telecommunication organizations³ and in the relevant meetings of the ITU.

² For the purposes of this document, UAS is referred to in ICAO as remotely piloted aircraft systems (RPAS).

³ African Telecommunication Union (ATU), Asia-Pacific Telecommunity (APT), European Conference of Postal and Telecommunications Administrations (CEPT), Inter-American Telecommunication Commission (CITEL), Arab Spectrum Management Group (ASMG) and the Regional Commonwealth in the Field of Communications (RCC).

4 Aeronautical aspects on the agenda for WRC-23

Note 1 – The statement of the ICAO Position on an agenda item is given in a text box at the end of the section addressing the agenda item, after the introductory background material.

*Note 2 – WRC-23 agenda items **1.6, 1.7, 1.8, 1.9, 1.10** and **9.2** address issues where aviation is seeking action by the WRC.*

*Note 3 – WRC-23 agenda items **1.1, 1.2, 1.3, 1.4, 1.11, 1.13, 1.15, 1.16, 1.17, 4, 8, and 9.1 topics a) and b), and 10** could potentially affect aviation use of spectrum and hence aviation should participate in studies to ensure there is no undue impact. As a result, they are included in this position.*

*Note 4 – No impact on aeronautical services has been identified from WRC-23 agenda items **1.5, 1.12, 1.14, 1.18, 1.19, 2, 3, 5, 6, 7, 9.1 topic c), 9.1 topic d)** and **9.3** which are therefore not addressed in this position.*

Note 5 – When in this document reference is made to “No. X.YYY”, it means “No. X.YYY of the ITU Radio Regulations”.

WRC-23 agenda item 1.1

Agenda item title

1.1 to consider, based on the results of ITU-R studies, possible measures to address, in the frequency band 4 800-4 990 MHz, protection of stations of the aeronautical and maritime mobile services located in international airspace and waters from other stations located within national territories, and to review the power flux-density criteria in No. 5.441B in accordance with Resolution 223 (Rev.WRC-19);

Discussion

This agenda item seeks to study the technical and regulatory provisions necessary to ensure the protection of aeronautical and maritime mobile services, located either in or above international waters, from other stations located within national territories and operating in the frequency band 4 800-4 990 MHz. Additionally, the agenda item calls for the review of the pfd criteria contained in RR No. **5.441B**.

The frequency bands 4 800-4 825 MHz and 4 835-4 950 MHz are allocated to the aeronautical mobile service worldwide in accordance with the Table of Frequency Allocations and RR No. **5.442**. In addition, in parts of Region 2 and Australia as well as adjacent international airspace the frequency bands 4 400-4 940 and 4 825-4 835 MHz are used for aeronautical mobile telemetry for flight testing in accordance with the provisions of RR Nos. **5.440A**, **5.442** and Resolution **416 (WRC-07)**. According to Resolution **416 (WRC-07)** the aeronautical mobile telemetry emissions are limited to transmission from aircraft stations only.

Flight testing is key to maintaining and enhancing the safety of aircraft operation. Analysis of data gathered during flight testing is used to evaluate the aerodynamic flight characteristics of the vehicle and the performance of the systems onboard that vehicle in order to validate the design and its safety. The flight test phase allows any identified design issues to be addressed and resolved, as well as verifying and documenting the vehicle's performance for government certification and customer acceptance. It is key to ensure the integrity of the flight test data. Any interference to the transmission or reception of flight test data, if spotted, may invalidate the test data gathered during that flight and hence require a repetition of that flight test or if not spotted cause nugatory work to be carried out to address an issue that does not exist.

However, assignments to certain types of aeronautical systems, for example radio links between aircraft, are not registered in the MIFR. The absence of such recording together with RR No. **8.1**, which states that *rights and obligations of administrations in respect of frequency assignments shall be derived from the recording of those assignments in the MIFR*, could lead to questions being raised as to why the protection of the aeronautical mobile service is required. Unfortunately, although the Radio Regulations require assignments to be registered in order to be internationally recognized (RR Nos. **11.2** & **11.8**), provision RR No. **11.14** precludes the notification and registration of frequency assignments to aeronautical mobile stations that do not have associated aeronautical land stations. This apparent discrepancy should be resolved in a manner that ensures recognition and protection of aviation systems when they are operated in international airspace.

Though this agenda item is limited to the frequency band 4 800-4 990 MHz, its considerations might have influence on a general regulatory mechanism of protection of the aeronautical mobile service in

international airspace. It is essential to ensure that the proposed methods to satisfy this agenda item would not have a negative impact on the use of aviation systems in other frequency bands.

ICAO Position

To support any measures based on the results of studies taken to ensure the protection of flight testing in international airspace, especially those stations operated in accordance with RR No. **5.440A**.

To oppose any proposed measure that is not in line with the results of studies and reduces the level of protection of flight test operations in international airspace and above international waters, especially those operated in accordance with RR No. **5.440A**.

To ensure that the proposed methods to satisfy this agenda item do not have a negative impact on the use of aviation systems in other frequency bands.

WRC-23 agenda item 1.2

Agenda item title

1.2 to consider identification of the frequency bands 3 300-3 400 MHz, 3 600-3 800 MHz, 6 425-7 025 MHz, 7 025-7 125 MHz and 10.0-10.5 GHz for International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution 245 (WRC-19);

Discussion

The agenda item, based on the called for studies, seeks additional IMT identification, and possible new allocations to the mobile service identified for IMT on a primary basis in the frequency bands:

- 3 300-3 400 MHz (Region 1 & 2);
- 3 600-3 800 MHz (Region 2);
- 6 425-7 025 MHz (Region 1);
- 7 025-7 125 MHz (globally);
- 10.0-10.5 GHz (Region 2).

In parts of Region 2, as well as adjacent international airspace, the frequency band 5 925-6 700 MHz is used for aeronautical mobile telemetry for flight testing in accordance with the provisions of Resolution **416 (WRC-07)**.

Flight testing is key to maintaining and enhancing the safety of aircraft. Analysis of data gathered during flight testing is used to evaluate the aerodynamic flight characteristics of the vehicle and the performance of the systems onboard that vehicle in order to validate the design and its safety. The flight test phase allows any identified design issues to be addressed, as well as verifying and documenting the vehicles performance for government certification and customer acceptance.

It is key to ensure the integrity of the flight data. Any interference to the transmission or reception of flight test data, if spotted, may invalidate the test data gathered during that flight and hence require a repetition of that flight, or if not spotted, cause unnecessary work to be carried out to address an issue that does not exist.

Parts of the frequency bands 3 600-3 800 MHz and 6 425-7 025 MHz are allocated to the fixed satellite service (FSS) are used by FSS feeder links (downlinks and uplinks) of GSO mobile satellite service (MSS) networks to support the transmission of AMS(R)S communications in the 1.6/1.5 GHz bands, which is used to support ATC and aircraft operations by many ANSPs and airlines. GSO satellites have visibility over a very wide area (about one third of the Earth surface), so any interference to MSS feeder uplinks operated in the band 6 425-6 575 MHz could endanger aircraft operations over a similar-sized area.

Some GSO very small aperture terminals (VSAT) may operate in the FSS in some countries of Region 1 and Region 2 in the frequency bands 3 600-3 700 MHz and 6 425-6 525 MHz for the provision of aeronautical services.

ITU-R studies identified under Resolution **245 (WRC-19)** will need to be completed to determine the potential for sharing of IMT with the FSS. In advance of results of these studies, ITU-R Report S.2368

contains sharing studies between IMT-Advanced systems and GSO FSS in the 3 400-4 200 MHz and 4 500-4 800 MHz frequency bands in the WRC study cycle leading to WRC-15⁴.

The report summarises the required separation distances presented in the individual technical studies to protect GSO FSS earth stations. The separation distances vary depending on the study and range from approximately ten to well over a hundred km for protection of the FSS interference criteria.

Studies have been conducted by the ITU-R to assess the aggregate interference from IMT systems to FSS satellites in the band 6 425-7 075 MHz. The studies show a range of results, in some cases showing interference below the FSS protection criterion, and in other cases showing interference above the criterion. The differences are mainly related to the scenarios used and to different assumptions on the number of IMT base station operating and their characteristics.

Recently ICAO has received several studies regarding the interference potential to radio altimeters from new mobile service systems planned to operate in frequency bands adjacent/nearby to that used by those altimeters. The radio altimeter is a mandated critical aircraft safety system operating in the 4 200-4 400 MHz frequency band and used to determine the aircraft's height above terrain, enabling several safety related flight operations and navigation functions on all commercial aircraft and a wide range of other civil aircraft types. Such functions and systems include terrain awareness, aircraft collision avoidance, wind shear detection, flight controls, and functions to automatically land an aircraft. Harmful interference to the function of the radio altimeter during any phase of flight would pose a serious safety risk. It is important to note, however, that the issues raised by the radio altimeter studies are not with the regulatory allocation and identification to the mobile service (i.e., it is not pertinent to WRC-23 agenda item 1.2 discussions), rather to how new systems are being authorized for deployment within that service. Work continues to assess any possible measures that might be needed, both near-term and in the future, to ensure compatible operation of radio altimeters and these new mobile service systems.

ICAO Position

To ensure that any IMT identification in the Region 2 in the frequency bands 3 600-3 800 MHz would include technical conditions to protect FSS in order to continue the use of these bands by the FSS for the provision of aeronautical services.

In case of any IMT identification in the frequency band 6 425-6 575 MHz in Region 1, regulatory provisions would be required for protecting FSS uplinks in order to continue the use of these bands by GSO FSS networks used for the provision of aeronautical services.

In case of any IMT identification in the frequency band 6 425-6 700 MHz in Region 1, to ensure that the flight test operations in accordance with Resolution **416 (WRC-07)** would not be affected in Region 2.

WRC-23 agenda item 1.3

⁴ Report ITU-R S.2368-0: Sharing studies between International Mobile Telecommunication-Advanced systems and geostationary satellite networks in the fixed-satellite service in the 3 400-4 200 MHz and 4 500-4 800 MHz frequency bands in the WRC study cycle leading to WRC-15 (<https://www.itu.int/pub/R-REP-S.2368>)

Agenda item title

1.3 to consider primary allocation of the band 3 600-3 800 MHz to the mobile service in Region 1 and take appropriate regulatory actions, in accordance with Resolution 246 (WRC-19);

Discussion

The agenda item, based on the called for studies, seeks to upgrade the secondary allocation to the mobile service identified for IMT in the frequency band 3 600-3 800 MHz in Region 1.

Systems operating under the allocation to the fixed satellite service (FSS) in the frequency range 3 400-4 200 MHz provide ground infrastructure for the transmission of critical aeronautical and meteorological information. These systems are also used for feeder links to support systems providing an aeronautical mobile satellite (route) service. Reports ITU-R M.2109 & ITU-R S.2199 contain sharing studies between systems operating under an allocation to the FSS and international mobile telecommunication (IMT) systems and broadband wireless access systems respectively in the frequency range 3 400-4 200 MHz. Studies show a potential for interference from IMT and broadband wireless access stations into Earth station in the FSS at distances of up to several hundred kilometres. Such large separation distances would impose substantial constraints on both mobile and satellite deployments. The studies also show that interference can occur when IMT systems are operated in frequency bands adjacent to those used by the FSS.

In addition, WRC-12 adopted Resolution **154** (revised at WRC-15) to support existing and future operation of Earth stations in the FSS within the frequency band 3 400-4 200 MHz, as an aid to safe operation of aircraft and reliable distribution of meteorological information in some countries, mainly in Africa, of Region 1

Recently ICAO has received several studies regarding the interference potential to radio altimeters from new mobile service systems planned to operate in frequency bands adjacent/nearby to that used by those altimeters. The radio altimeter is a mandated critical aircraft safety system operating in the 4 200-4 400 MHz frequency band and used to determine the aircraft's height above terrain, enabling several safety related flight operations and navigation functions on all commercial aircraft and a wide range of other civil aircraft types. Such functions and systems include terrain awareness, aircraft collision avoidance, wind shear detection, flight controls, and functions to automatically land an aircraft. Harmful interference to the function of the radio altimeter during any phase of flight would pose a serious safety risk.

It is important to note, however, that the issues raised by the radio altimeter studies are not with the regulatory allocation and identification to the mobile service (i.e., it is not pertinent to WRC-23 agenda item 1.3 discussions), rather to how new systems are being authorized for deployment within that service. Work continues to assess any possible measures that might be needed, both near-term and in the future, to ensure compatible operation of radio altimeters and these new mobile service systems.

ICAO Position

To ensure that any mobile allocation in Region 1 in the frequency bands 3 600-3 800 MHz would include technical conditions to protect FSS in order to continue the use of these bands by the FSS for the provision of aeronautical services, including GSO MSS feeder links for the purpose of supporting aeronautical services.

WRC-23 agenda item 1.4

Agenda item title

1.4 *to consider, in accordance with Resolution 247 (WRC-19), the use of high-altitude platform stations as IMT base stations (HIBS) in the mobile service in certain frequency bands below 2.7 GHz already identified for IMT, on a global or regional level;*

Discussion

At WRC-2000, the frequency bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3, and the frequency bands 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2 were identified in RR No. **5.388A** for possible use by high-altitude platform stations as international mobile telecommunications (IMT) base stations (HIBS) within the mobile service allocation. Resolution **221 (Rev.WRC-07)** referred to in RR No. **5.388A** stipulates technical conditions for HIBS necessary for the protection of ground-based IMT stations in neighbouring countries and other services based on the sharing and compatibility studies with IMT-2000.

In view of increasing demand to provide mobile broadband services to underserved areas and noting the increase in the number of frequency bands within which ground based IMT is deployed, there is a need to review the existing regulations for HIBS with a view to providing flexibility for the operators to deploy HIBS in all frequency bands below 2.7 GHz that are identified for IMT. This review should include the fact that HIBS are expected to be used as a part of terrestrial IMT networks and may use the same frequency bands as ground-based IMT base stations. As a result, this agenda item considers appropriate technical conditions and regulatory actions for HIBS in certain frequency bands below 2.7 GHz that are already identified for IMT, i.e.:

- 694-960 MHz;
- 1 710-1 885 MHz (1 710-1 815 MHz to be used for uplink only in Region 3);
- 2 500-2 690 MHz (2 500-2 535 MHz to be used for uplink only in Region 3, except 2 655-2 690 MHz in Region 3).

In accordance with *resolves* 2 of Resolution **247 (WRC-19)**, the sharing and compatibility studies under this agenda item should ensure the protection of services having allocations in the same and adjacent frequency bands.

One of the frequency bands considered for HIBS is 694-960 MHz, which is adjacent to the band 960-1 164 MHz allocated to AM(R)S and ARNS and heavily used by aeronautical systems, e.g., ADS-B, DME, LDACS, SSR etc.

Another frequency band being considered is 2 500-2 690 MHz which is close to the frequency band 2 700-2 900 MHz used for the provision of primary approach radars. Regarding that latter band, in order to enable the deployment of ground based IMT below 2 690 MHz the existing radars had to be modified to increase the receiver front end filter rejection in order to cope with the power in the IMT fundamental signal. The design of those modifications was based on a specific set of assumptions about the deployment of IMT base stations, the antenna characteristics including height and directivity, and the use of a specific terrestrial propagation model (Recommendation ITU-R P.452). Placing the IMT base station on a high-altitude

platform changes the assumptions used in determining the modifications required to the radar receiver front ends to accommodate ground based IMT. It is essential to ensure that by placing the base station on a high-altitude platform the maximum level of signal received by the radar both in-band and out of band from IMT does not exceed those predicted during the studies on ground based IMT and on which the radar modifications were designed.

ICAO Position

To ensure that any identification of frequency bands for high-altitude platform stations as IMT-base stations (HIBs) should include provisions for the protection of aeronautical systems operating in the frequency bands 960-1 164 MHz and 2 700-2 900 MHz.

To oppose the use of HIBS within the frequency band 2 500-2 690 MHz or parts thereof if agreed studies have not demonstrated the protection of aeronautical systems.

WRC-23 agenda item 1.6

Agenda item title

1.6 to consider, in accordance with Resolution 772 (WRC-19), regulatory provisions to facilitate radiocommunications for sub-orbital vehicles;

Discussion

Sub-orbital vehicles have been developed to reach altitudes and velocities that are much higher than conventional aircraft. Re-usable sub-orbital vehicles that launch like traditional rockets have become routine. Furthermore, with the advances in technology, re-useable sub-orbital vehicles that take off and land on a traditional runway are close to becoming a reality with companies testing such vehicles. These vehicles are intended to perform various missions, such as deploying satellites, conducting scientific research, or carrying passengers and cargo, and then returning to the Earth's surface. As one example, such vehicles could lead to hypersonic travel from Europe to Australia in 90 minutes, down from the current 24 hours.

The integration of sub-orbital vehicles into airspace managed by **Member States** will create various challenges for spectrum usage and frequency management. A sub-orbital vehicle could share airspace with conventional aircraft during certain portions of its flight, or be separated procedurally to maintain aviation safety. Therefore, there is a need, in some cases, for that vehicle to communicate with other airspace users and air traffic control, as decided by the **Member States**. These sub-orbital vehicles may use a number of different terrestrial and space services, some standardized by ICAO, in various ranges of frequency bands.

With respect to spectrum for systems and applications related to aviation safety, ICAO standardized systems are necessary for harmonization and interoperability with the air traffic management system. However, sub-orbital vehicles are intended to achieve altitudes and velocities that are much higher than conventional aircraft and hence do not always perform as an aircraft. Also, the way that on-board ICAO-standard terrestrial or satellite systems operate may not necessarily be consistent with the definitions in the RR. Therefore, in the current Radio Regulations, there is not a clear regulatory understanding as to how stations on board sub-orbital vehicles should be addressed and hence no clear understanding as to the radio service(s) under which they should operate.

Studies have shown that in principle from a technical perspective, some of the current ICAO standardized systems should have the capability, although potentially not the capacity, to provide suitable radio links for sub-orbital vehicles to operate safely. RR modifications (e.g., a WRC Resolution) may be required at WRC-23 to address the outcome of the studies under Resolution **772 (WRC-19)**. Any such changes to the Radio Regulations shall not create constraints on aeronautical operations.

ICAO Position

To support the regulatory provision for terrestrial stations and earth stations required onboard a suborbital vehicle to safely integrate it into air traffic service airspace, as decided by the **responsible Member State(s)**, to maintain the services under which these stations are **classified**.

Any such changes to the Radio Regulations shall not create constraints on aeronautical operations.

WRC-23 agenda item 1.7

Agenda item title

1.7 to consider a new aeronautical mobile-satellite (R) service (AMS(R)S) allocation in accordance with Resolution 428 (WRC-19) for both the Earth-to-space and space-to-Earth directions of aeronautical VHF communications in all or part of the frequency band 117.975-137 MHz, while preventing any undue constraints on existing VHF systems operating in the AM(R)S, the ARNS, and in adjacent frequency bands;

Discussion

The use of low-Earth orbiting satellites for VHF aeronautical safety and regularity of flight messages between the pilot and controller have a potential to augment, but not replace, coverage of existing terrestrial VHF communications facilities. Several proposals currently being studied would provide complementary service to oceanic and remote regions that already exist for global navigation satellite systems and satellite-based surveillance systems. These implementations would all use existing on-board aircraft VHF radios without any needed modification.

Such an AMS(R)S system will provide significant operational benefits to many different regions globally, but may not be viable in all areas given the extensive usage of existing AM(R)S systems in some Administrations. Therefore, in addition to any applied ITU coordination procedures, complementary coordination procedures in the ICAO will need to be established to ensure that all relevant entities are consulted before any frequency is used and not constrain the current or future AM(R)S systems in the same band.

ICAO Position

To support a global primary allocation to the aeronautical mobile-satellite (route) service for both the Earth-to-space and space-to-Earth directions in all or part of the frequency band 117.975-137 MHz subject to the following conditions:

- The use of any new AMS(R)S allocation be limited to aeronautical VHF communications for safety and regularity of flight.
- Ensure the protection of existing primary terrestrial aeronautical systems in the 117.975-137 MHz band, and not constrain the planned usage of those systems.

The systems shall be implemented, operated, and planned, in accordance with international Standards and Recommended Practices and procedures established in accordance with the Convention on International Civil Aviation.

WRC-23 agenda item 1.8

Agenda item title

1.8 to consider, on the basis of ITU R studies in accordance with Resolution 171 (WRC-19), appropriate regulatory actions, with a view to reviewing and, if necessary, revising Resolution 155 (Rev.WRC-19) and No. 5.484B to accommodate the use of fixed-satellite service (FSS) networks by control and non-payload communications of unmanned aircraft systems;

Discussion

Resolution **155 (Rev.WRC-19)** was initially developed at WRC-15 and modified by WRC-19, with the aim of enabling the use of geostationary-satellite networks operating in the fixed-satellite service (FSS) to be used for the provision of unmanned aircraft control and non-payload communication (CNPC) in the following frequency bands:

- For downlink (space-to-Earth):
 - 10.95-11.2 GHz,
 - 11.45-11.7 GHz,
 - 11.7-12.2 GHz in Region 2,
 - 12.2-12.5 GHz in Region 3,
 - 12.5-12.75 GHz in Regions 1 and 3,
 - 19.7-20.2 GHz,
- For uplink (Earth-to-space):
 - 14-14.47 GHz,
 - 29.5-30.0 GHz.

Resolution **155 (Rev.WRC-19)**, in its *resolves*, contains the conditions under which an unmanned aircraft can use a satellite network operating in the FSS for CNPC. However, it was recognized when the Resolution was originally developed that:

- ICAO had yet to complete the development of the relevant international aeronautical Standards and Recommended Practices (SARPs);
- additional work would be required to assess the feasibility of using the satellite networks under the conditions contained in Resolution **155 (Rev.WRC-19)**;
- there may be inconsistencies between some of the *resolves*;
- Resolution **155 (Rev.WRC-19)** was originally developed during WRC-15, and modifications may be required once the further study work and relevant ICAO SARPs material had been completed to ensure that the provisions of the Resolution meet the ICAO requirements.

Therefore, the Resolution as developed by WRC-15, contained a clause requiring WRC-23 “to consider the results of the above studies referred to in this Resolution with a view to reviewing and, if necessary, revising this Resolution, and take necessary actions, as appropriate”. It also precluded operational use of the FSS by UAS CNPC before the review by WRC-23.

At WRC-19 Resolution **155** was revised and WRC-23 agenda item 1.8 adopted that through Resolution **171 (WRC-19)** *resolved to invite the ITU Radiocommunication Sector to:*

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- continue and complete in time for WRC-23 relevant studies of the technical, operational and regulatory aspects, based on the frequency bands mentioned in *resolves* 1 of Resolution **155 (Rev.WRC-19)**, in relation to the implementation of Resolution **155 (Rev.WRC-19)**, taking into account the progress obtained by ICAO in the completion of SARPs on use of the FSS for the UAS CNPC links;
- review RR No. **5.484B** and Resolution **155 (Rev.WRC-19)** taking into account the results of the above studies.

Additionally, Resolution **171 (WRC-19)** *invites the 2023 World Radiocommunication Conference* to revise, if necessary, RR No. **5.484B** and Resolution **155 (Rev.WRC-19)** and take other necessary actions, as appropriate, on the basis of the studies conducted under Resolutions **155 (Rev.WRC-19)** and **171 (WRC-19)**. Work on the ITU-R studies is continuing, and the final outcome of the work has not yet been reached in order to allow WRC-23 to make decisions.

In this context, ICAO is invited to develop aeronautical Standards and Recommended Practices (SARPs) identifying how UAS CNPC operates under the existing FSS primary allocation, based on Resolution **155 (Rev.WRC-19)**. As a basis for developing these SARPs, since CNPC is a safety-of-life aeronautical system, ICAO is expecting that the decision of WRC-23 results in a Resolution that;

- clearly provides primary status;
- removes the apparent inconsistencies;
- acknowledges that in accordance with the Annexes of the Convention of the International Civil Aviation Organization (ICAO), ensuring the safety-of-life aspects of the use of UAS CNPC is the role of the responsible States;
- provides sufficient information to support and/or validate safety cases;
- ensures that the UAS CNPC operator is notified prior to any change in the service provision performance being implemented as a result of the satellite coordination process;
- ensures that any change as a result of a satellite coordination process does not adversely affect the initial service level agreement.

Within the ITU during the last study period work has made substantive progress on Document ITU-R M.[UA_PFD] - Review of power flux-density limits in accordance with *resolves* 16 of Resolution **155 (WRC-15)**, which addresses the various *resolves* within Resolution **155**, however this work has not been formally completed. It has to be noted that this document will contain critical information that will be used for assessing the feasibility of UAS CNPC for different operational conditions, by ICAO, under Resolution **155**.

Within ICAO work has progressed on the development of Standards and Recommended Practices (SARPs) material. The first package of SARPs, dealing with the identification of frequency bands (including those listed in *resolves* 1 of Resolution **155 (Rev.WRC-19)** and C2 Link procedures, has been adopted and became effective on 12 July 2021, following a review of comments received from States. The second package of SARPs, endorsed by the RPAS Panel in November 2022 and now proceeding to State letter review, addresses the technical solutions for the FSS systems and the other relevant *resolves* of Resolution **155**. ICAO will be responsible for the safety-of-life aspects of UAS CNPC under the existing RF environment given by Resolution **155**.

The Director of the Radiocommunication Bureau will decide if the conditions included in the *instructs the Director of the Radiocommunication Bureau* 4 of Resolution **155 (Rev.WRC-19)** have been met. If they

have, satellite network filings submitted by administrations with a new class of station can then be considered for processing.

It should be noted that work under WRC-23 agenda item 1.16 (Resolution **173 (WRC-19)**) and WRC-23 agenda item 1.17 (Resolution **773 (WRC-19)**) may have impacts on the use of the FSS by UAS CNPC during the WRC-23 cycle. The implications of any proposed amendment under these agenda items to the Radio Regulations need to be assessed and action taken, if necessary, to ensure that the radio regulatory provisions established during WRC-23 do not adversely impact the use of the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz by unmanned aircraft for CNPC.

ICAO Position

To support the modification of RR No. **5.484B** and Resolution **155 (Rev.WRC-19)**.

ICAO is expecting that the decision of WRC-23 will result in a Resolution that:

- clearly provides primary status;
- removes any apparent inconsistencies;
- acknowledges that in accordance with the Annexes of the Convention of the International Civil Aviation Organization (ICAO), **ensuring the safety-of-life aspects of the use of UAS CNPC is the role of the responsible States;**
- provides sufficient information to support and/or validate safety cases; and
- ensures that the UAS CNPC operator is notified prior to any change in the service provision performance being implemented as a result of the satellite coordination process;
- ensures that any change as a result of a satellite coordination process does not adversely affect the initial service level agreement.

WRC-23 agenda item 1.9

Agenda item title

1.9 to review Appendix 27 of the Radio Regulations and consider appropriate regulatory actions and updates based on ITU-R studies, in order to accommodate digital technologies for commercial aviation safety-of-life applications in existing HF bands allocated to the aeronautical mobile (route) service and ensure coexistence of current HF systems alongside modernized HF systems, in accordance with Resolution 429 (WRC-19);

Discussion

HF is the only terrestrial service with means of providing ubiquitous global communication coverage for aircraft, and is still the long-range system required by many aviation regulators for the provision of safety and regularity of flight communications in oceanic, polar and remote areas. Access to the various frequency bands in the range 2 850-22 000 kHz assigned to the aeronautical mobile (route) service (AM(R)S) is therefore essential. Since the last substantive review of Appendix 27 at the 1979 World Administrative Radio Conference, use of HF by aviation has continued to evolve and grow, especially with the introduction of HF datalink in the 1990s; now used by many airlines.

To date, operational capacity has been limited by the number of 3 kHz channels available in the HF band. However, the development of advanced digital techniques, including new waveforms, allows the aggregation of independent 3 kHz channels (either contiguous or non-contiguous) into wideband links. This opens the possibility for simultaneous transmission of voice and data, thus improving capacity, connectivity, and quality of HF communication systems. Aviation would like to take advantage of these developments to provide aircraft with additional capabilities and to improve the reliability, availability and continuity of communications especially when used in conjunction with existing L-band aviation SATCOM systems.

In order to take advantage of the various benefits that a modern wideband HF communication system could offer, Appendix 27 of the Radio Regulations needs to be modified to allow the introduction of new digital wideband systems in accordance with Resolution 429 (WRC-19). For the purpose of this agenda item, the term “wideband” in HF communications may refer to a combination of multiple 3 kHz channels to provide improved data rates. With the availability of advanced digital technologies and the demonstrated capabilities of aeronautical wideband HF, including contiguous or non-contiguous channel aggregation, faster data rates and digital voice communications are possible.

Studies have identified minor changes to Appendix 27 that would both protect current users of aeronautical HF, and allow for the aggregation of narrowband channels into wideband links to support growing aviation need.

ICAO Position

To support modification of Appendix **27** to the Radio Regulations for explicitly recognizing digital HF wideband aeronautical communication systems in a manner fully compatible with existing aeronautical HF assignments, and without modifying the Appendix **27** allotment plan. Those systems shall be operated in accordance with international Standards and Recommended Practices and procedures established in accordance with the Convention on International Civil Aviation.

WRC-23 agenda item 1.10

Agenda item title

1.10 to conduct studies on spectrum needs, coexistence with radiocommunication services and regulatory measures for possible new allocations for the aeronautical mobile service for the use of non-safety aeronautical mobile applications, in accordance with Resolution 430 (WRC-19);

Discussion

As technology has developed and miniaturization has advanced, it has become possible to use aircraft as platforms for payload applications such as fire and border surveillance, air quality and environment monitoring, video surveillance, terrain mapping, and imagery such as film-making. As a result, the number of aircraft equipped with sensors and the demand for associated communication links to offload large amounts of data has also grown and is expected to continue to grow. Those communication links, whilst not associated with aeronautical safety, can be mission critical in providing data or sensor control for the application that they are supporting.

At the same time, there is no clear identification of the frequency bands in which non-safety aeronautical mobile applications can operate, due in-part to the limitations often placed on existing mobile allocations that either preclude or place technical/operational restrictions that are not compatible with aeronautical use. This has stifled further development due to a lack of confidence within the industry of long-term spectrum access and stability.

In consequence, there is a need for adaptation of the current regulatory framework in order to clearly identify spectrum that could only be used for aeronautical payload communication, giving the industry the stability it needs to allow it to develop innovative applications that can deliver tangible benefits. However, it is important that there is a clear distinction between such systems and those used to provide safety and regularity of flight communications, including UAS command and control functions.

The objective of this agenda item is to assess spectrum requirements for new non-safety aeronautical mobile service applications and seek:

- possible new primary allocations to the aeronautical mobile service in frequency band 15.4-15.7 GHz for such non-safety aeronautical applications; and
- possible revision of the “except aeronautical mobile” in the frequency band 22-22.21 GHz, already allocated on a primary basis to the mobile, except aeronautical mobile, service.

ICAO Position

Based upon the agreed results of studies, not to oppose new allocations to the aeronautical mobile service for use by non-safety aeronautical mobile applications on a primary basis in the frequency bands 15.4-15.7 GHz and 22-22.21 GHz.

To ensure that any such modification does not adversely affect the status or provision of aeronautical safety services.

WRC-23 agenda item 1.11

Agenda item title

1.11 *to consider possible regulatory actions to support the modernization of the Global Maritime Distress and Safety System and the implementation of e-navigation, in accordance with Resolution 361 (Rev.WRC-19);*

Discussion

Aircraft, of which helicopters are a subset, are an integral part of the global maritime distress and safety system, providing a rapid search capability that can affect a rescue or direct surface vessels to the scene of the incident. As such, they are fitted with appropriate Global Maritime Distress and Safety System (GMDSS) radio equipment to facilitate such activities. It is therefore essential to ensure that any change to the regulatory provisions and spectrum allocations resulting from this agenda item do not adversely impact on the capability of search and rescue aircraft to effectively communicate with vessels during disaster relief operations.

In addition, ICAO requires, inter alia, that satellite systems supporting aeronautical satellite safety communications (aeronautical mobile-satellite (route) service), must comply with priority requirements contained in ICAO Standards and Recommended Practices (SARPs). Therefore, if a system which already carries such communications were to be approved by the International Maritime Organization and identified to carry GMDSS, any resultant changes to the Radio Regulations should not adversely impact that, or other, system's SARPs compliance.

ICAO Position

To ensure that any change to the regulatory provisions and spectrum allocations resulting from this agenda item do not adversely impact on the capability of search and rescue aircraft, including helicopters, to effectively communicate with vessels during disaster-relief operations.

With respect to Resolution **361 (Rev.WRC-19)**, *resolves 3*, to ensure that any regulatory provisions in response to this agenda item do not adversely affect the compliance of aeronautical mobile-satellite (route) service systems in the frequency band 1 610-1 626.5 MHz with international standards and recommended practices and procedures established in accordance with the Convention on International Civil Aviation.

WRC-23 agenda item 1.13

Agenda item title

1.13 *to consider a possible upgrade of the allocation of the frequency band 14.8-15.35 GHz to the space research service, in accordance with Resolution 661 (WRC-19);*

Discussion

Under this agenda item, the following studies are to be conducted:

- a) to investigate and identify all relevant scenarios between data relay satellites, non-geostationary satellites and manned flights in the space research service operating in the frequency band 14.8-15.35 GHz, to investigate and identify all relevant scenarios that need to be considered in compatibility and sharing studies, taking into account the latest relevant ITU Radiocommunication Sector (ITU-R) Recommendations;
- b) to conduct and complete in time for WRC-23 sharing and compatibility studies in order to determine the feasibility of upgrading the SRS allocation to primary status in the frequency band 14.8-15.35 GHz, with a view to ensuring protection of the primary services;
- c) to determine the technical and regulatory conditions according to the results of the studies necessary to ensure b) above.

Currently, the frequency band 14.8-15.35 GHz is allocated to the generic mobile and fixed services on a primary basis. According to Recommendations ITU-R M.2089 mentioned in *noting a)* of Resolution **661 (WRC-19)**, systems operating in the aeronautical mobile service in the frequency range 14.5-15.35 GHz are used by airborne data links to support remote sensing applications on board either manned or unmanned aircraft. In addition, in some States systems operating under the fixed service allocation are used to support air traffic operations. Neither of these applications use ICAO standardized systems.

ICAO Position

To ensure that any radio regulatory action taken as a result of agreed studies does not adversely affect the provision of aeronautical services.

WRC-23 agenda item 1.15

Agenda item title

1.15 to harmonize the use of the frequency band 12.75-13.25 GHz (Earth-to-space) by earth stations on aircraft and vessels communicating with geostationary space stations in the fixed-satellite service globally, in accordance with Resolution 172 (WRC-19);

Discussion

This agenda item seeks to harmonize the use of the frequency band 12.75-13.25 GHz (Earth-to-space) by earth stations on board an aircraft or vessel communicating with geostationary space stations in the fixed satellite service operating in accordance with the provisions of RR Appendix **30B** (No. **5.441**). It resolves that such earth stations shall not be used or relied upon for safety-of-life applications nor result in changes or restrictions to existing Plan allotments and List assignments made under RR Appendix **30B**.

Resolution **172 (WRC-19)** calls for studies to:

- Identify the technical and operational characteristics and user requirements of earth stations on aircraft and vessels that communicate or plan to communicate with geostationary (GSO) space stations in the FSS in the frequency band 12.75-13.25 GHz (Earth-to-space) under the envelope of RR Appendix **30B** Article 6 recorded in the List or the Master International Frequency Register (MIFR) with favourable finding only;
- address the sharing and compatibility issues between earth stations on aircraft and vessels communicating with GSO space stations in the fixed satellite service with current and planned stations of existing services as well as services in adjacent frequency bands;
- to study the responsibility of the entities involved in the operation of the earth stations on aircraft and vessels;
- to develop the criteria to ensure that earth stations on aircraft and vessels, as a new FSS application in this frequency band, shall not claim more protection nor cause more interference than filed earth stations in RR Appendix **30B**.

Once consensus has been reached on those studies the Resolution calls on the ITU-R to develop technical conditions and regulatory provisions for the harmonised operation of earth stations on aircraft and vessels communicating with GSO space stations in the FSS operating in the frequency band 12.75-13.25 GHz (Earth-to-space). Those technical conditions and regulatory provisions shall ensure the protection of and not impose undue constraints on, the existing services in that frequency band. Additionally, they shall not adversely affect the criteria contained in Annex 4 to RR Appendix **30B** including the cumulative effect of multiple earth stations on aircraft and vessels nor limit access of other administrations to their national resources in RR Appendix **30B**.

WRC-23 should then consider the relevant regulatory action necessary based on the work, as detailed above, undertaken during this study period whilst ensuring that any action taken does not result in any additional status than that of the GSO satellite networks with which these stations are communicating.

The introduction of earth station in motion operations into a frequency band that is subject to RR Appendix **30B** restrictions could provide a welcome additional capacity for non-safety passenger/payload communication. Additionally, given the restriction that such use shall not be or relied upon for safety-of-life communication this agenda item should not adversely affect the provision of aeronautical safety service. However, how this agenda item develops needs to be monitored to ensure that modifications are not introduced that change that expectation.

See also WRC-23 agenda item 1.16.

ICAO Position

To ensure that any radio regulatory action, taken as a result of this agenda item, does not adversely affect the provision of aeronautical safety-of-life services.

WRC-23 agenda item 1.16

Agenda item title

1.16 to study and develop technical, operational and regulatory measures, as appropriate, to facilitate the use of the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) by non-geostationary fixed-satellite service earth stations in motion, while ensuring due protection of existing services in those frequency bands, in accordance with Resolution 173 (WRC-19);

Discussion

This agenda item seeks to extend the concept of earth stations in motion (ESIMs) communicating with geostationary space stations, to operation of ESIMs with non-geostationary space stations in the fixed-satellite service (FSS) to the 17.7-18.6 GHz, 18.8-19.3 GHz, 19.7-20.2 GHz (space-to-Earth), 27.5-29.1 GHz and 29.5-30 GHz frequency bands.

Resolution **173 (WRC-19)** calls for studies to:

- identify the technical and operational characteristics and user requirements of the different types of ESIMs that plan to operate within non-geostationary (non-GSO) satellite systems operating in the FSS in the frequency bands or parts thereof identified;
- address the sharing and compatibility between ESIMs communicating with non-GSO FSS systems and current & planned stations of primary services allocated in the frequency bands identified as well as in the adjacent frequency bands.

The Resolution also calls on the ITU-R to develop technical conditions and regulatory provisions for the operation of aeronautical and maritime ESIMs communicating with non-GSO space stations operating in the FSS in the frequency bands identified. Those technical conditions and regulatory provisions shall ensure the protection of and not impose additional constraints on the existing services in the frequency bands identified.

ITU-R should also consider the relevant regulatory action necessary based on the work, as detailed above, undertaken during this study period.

It should be noted that the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz are identified within Resolution **155 (Rev.WRC-19)** for the provision of unmanned aircraft systems (UAS) control and non-payload communication (CNPC). However, both Resolution **156 (WRC-15)** that regulates the use of these frequency bands for ESIMs communicating to GSO satellites and Resolution **173 (WRC-19)** that seeks to facilitate the use of ESIMs communicating to non-GSO satellites in these frequency bands preclude the use of the relevant ESIMs from being used or relied upon for safety-of-life applications. The implications of any proposed amendment under WRC-23 agenda item 1.16 to the Radio Regulations need to be assessed and action taken if they:

- could adversely affect the provision of UAS CNPC under Resolution **155 (Rev.WRC-19)**;
- do not make a clear regulatory distinction between satellite networks or satellite network resources providing UAS CNPC and those providing non-safety ESIMs applications such that

it does not set a precedent that could adversely affect the provision of aeronautical safety-of-life services.

See also WRC-23 agenda items 1.8, 1.15 and 1.17.

ICAO Position

To ensure that any radio regulatory action taken as a result of this agenda item:

- do not adversely affect the provision of UAS CNPC under Resolution **155 (Rev.WRC-19)**;
- make a clear regulatory distinction between satellite networks or satellite network resources providing UAS CNPC and those providing non-safety ESIMs applications such that it does not set a precedent that could adversely affect the provision of aeronautical safety-of-life services.

WRC-23 agenda item 1.17

Agenda item title

1.17 to determine and carry out, on the basis of ITU-R studies in accordance with Resolution 773 (WRC-19), the appropriate regulatory actions for the provision of inter-satellite links in specific frequency bands, or portions thereof, by adding an inter-satellite service allocation where appropriate;

Discussion

Inter-satellite links have traditionally been used to relay communication between space stations, normally situated on non-geostationary satellites, and an earth station where direct communication is impeded for some reason such as being beyond visual line of sight. With the planned expansion in the use of low earth orbit satellites the demand for inter-satellite links and associated spectrum is also increasing. This agenda item seeks to develop the technical conditions and regulatory provisions, including potential new allocations to the inter-satellite service, by which the different types of space station can operate inter-satellite links in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz.

Resolution **773 (WRC-19)** calls for studies to:

- identify the technical and operational characteristics, including spectrum requirements, for transmissions between space stations in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz;
- address the sharing and compatibility between satellite-to-satellite links intending to operate between space stations in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz and current and planned stations of the FSS and other existing services allocated in same frequency bands and adjacent frequency bands,

Based on those studies the Resolution calls on the ITU-R to develop, for different types of space stations, the technical conditions and regulatory provisions for satellite-to-satellite operations, including potential new inter-satellite service allocations, in the frequency bands identified.

WRC-23 should then consider the relevant regulatory action necessary based on the work, as detailed above, undertaken during this study period whilst ensuring the protection of the fixed and mobile services allocated on a primary basis within the identified frequency bands.

It should be noted that the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz are identified within Resolution **155 (Rev.WRC-19)** for the provision of unmanned aircraft systems (UAS) control and non-payload communication (CNPC). It is therefore important that the implications of any proposed amendment under WRC-23 agenda item 1.17 to the Radio Regulations are assessed and action taken if they could adversely affect the provision of UAS CNPC under Resolution **155 (Rev.WRC-19)**,

See also WRC-23 agenda items 1.8 and 1.16.

ICAO Position

To ensure that, given the overlap in frequency bands, any radio regulatory action taken as a result of this agenda item does not adversely affect the protection of the GSO stations in the frequency bands listed in Resolution **155 (Rev.WRC-19)**.

WRC-23 agenda item 4 _____

Agenda item title

4 *in accordance with Resolution 95 (Rev.WRC-19), to review the Resolutions and Recommendations of previous conferences with a view to their possible revision, replacement or abrogation;*

ICAO Position

Resolutions:

Resolution No.	Title	Action recommended
18 (Rev.WRC-15)	Relating to the procedure for identifying and announcing the position of ships and aircraft of States not parties to an armed conflict.	No change
20 (Rev.WRC-03)	Technical cooperation with developing countries in the field of aeronautical telecommunications.	No change
26 (Rev.WRC-19)	Footnotes to the Table of Frequency Allocations in Article 5 of the Radio Regulations.	No change
27 (Rev.WRC-19)	Use of incorporation by reference in the Radio Regulations.	No change
63 (Rev.WRC-12)	Protection of radiocommunication services against interference caused by radiation from industrial, scientific and medical (ISM) equipment.	No change
76 (Rev.WRC-15)	Protection of geostationary fixed-satellite service and geostationary broadcasting-satellite service networks from the maximum aggregate equivalent power flux-density produced by multiple non-geostationary fixed-satellite service systems in frequency bands where equivalent power flux-density limits have been adopted.	No change
95 (Rev.WRC-19)	General review of the resolutions and recommendations of world administrative radio conferences and world radiocommunication conferences.	No change

Resolution No.	Title	Action recommended
114 (<i>Rev.WRC-15</i>)	Studies on compatibility between new systems of the aeronautical radionavigation service and the fixed-satellite service (Earth-to-space) (limited to feeder links of the non-geostationary mobile-satellite systems in the mobile-satellite service) in the frequency band 5 091-5 150 MHz.	No change
140 (<i>Rev.WRC-15</i>)	Measures and studies associated with the equivalent power flux-density (epfd) limits in the band 19.7-20.2 GHz.	No change
154 (<i>WRC-15</i>)	Consideration of technical and regulatory actions in order to support existing and future operation of fixed-satellite service earth stations within the band 3 400-4 200 MHz, as an aid to the safe operation of aircraft and reliable distribution of meteorological information in some countries in Region 1.	No change
155 (<i>Rev.WRC-19</i>)	Regulatory provisions related to earth stations on board unmanned aircraft which operate with geostationary-satellite networks in the fixed-satellite service in certain frequency bands not subject to a plan of Appendices 30 , 30A and 30B for the control and non-payload communications of unmanned aircraft systems in non-segregated airspaces.	Subject to WRC-23 agenda item 1.8.
156 (<i>WRC-15</i>)	Use of the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz by earth stations in motion communicating with geostationary space stations in the fixed-satellite service	Modify if necessary to ensure clear distinction between ESIMs providing non-safety applications and unmanned aircraft control and non-payload communication covered in Resolution
160 (<i>WRC-15</i>)	Facilitating access to broadband applications delivered by high-altitude platform stations.	Suppress based on the results of studies carried out under WRC-19 agenda item 1.14.

Resolution No.	Title	Action recommended
165 (WRC-19)	Use of the frequency band 21.4-22 GHz by high-altitude platform stations in the fixed service in Region 2	No change
166 (WRC-19)	Use of the frequency band 24.25-27.5 GHz by high-altitude platform stations in the fixed service in Region 2	No change
167 (WRC-19)	Use of the frequency band 31-31.3 GHz by high-altitude platform stations in the fixed service	No change
168 (WRC-19)	Use of the frequency band 38-39.5 GHz by high-altitude platform stations in the fixed service	No change
171 (WRC-19)	Review and possible revision of Resolution 155 (Rev.WRC-19) and No. 5.484B in the frequency bands to which they apply	Subject to WRC-23 agenda item 1.8.
172 (WRC-19)	Operation of earth stations on aircraft and vessels communicating with geostationary space stations in the fixed-satellite service in the frequency band 12.75-13.25 GHz (Earth-to-space)	Subject to WRC-23 agenda item 1.15.
173 (WRC-19)	Use of the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) by earth stations in motion communicating with non-geostationary space stations in the fixed-satellite service	Subject to WRC-23 agenda item 1.16.
176 (WRC-19)	Use of the frequency bands 37.5-39.5 GHz (space-to-Earth), 40.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) by aeronautical and maritime earth stations in motion communicating with geostationary space stations in the fixed-satellite service	Modify or suppress as necessary based on the results of studies carried out (preliminary WRC-27 agenda item 2.2).
205 (Rev.WRC-19)	Protection of the systems operating in the mobile satellite service in the band 406-406.1 MHz.	No change

Resolution No.	Title	Action recommended
207 (Rev.WRC-15)	Measures to address unauthorized use of and interference to frequencies in the bands allocated to the maritime mobile service and to the aeronautical mobile (R) service.	No change
217 (WRC-97)	Implementation of wind profiler radars.	No change
222 (Rev.WRC-12)	Use of the frequency bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz by the mobile-satellite service, and procedures to ensure long-term spectrum access for the aeronautical mobile-satellite (R) service.	No change
223 (Rev WRC-19)	Additional frequency bands identified for International Mobile Telecommunications	Modify, retain, or suppress, <i>invites the ITU Radiocommunications Sector 1</i> to Resolution 223 , as appropriate, reflecting the need for continued studies, based on the results of the studies called for by that provision.
225 (Rev.WRC-12)	Use of additional frequency bands for the satellite component of IMT.	No change
229 (Rev.WRC-19)	Use of the frequency bands 5 150-5 250 MHz, 5 250-5 350 MHz and 5 470-5 725 MHz by the mobile service for the implementation of wireless access systems including radio local area networks	No change
240 (WRC-19)	Spectrum harmonization for railway radiocommunication systems between train and trackside within the existing mobile-service allocations.	Monitor studies and ensure protection of aeronautical systems.
245 (WRC-19)	Studies on frequency-related matters for the terrestrial component of International Mobile Telecommunications identification in the frequency bands 3 300-3 400 MHz, 3 600-3 800 MHz, 6 425-7 025 MHz, 7 025-7 125 MHz and 10.0-10.5 GHz	Subject to WRC-23 agenda item 1.2.

Resolution No.	Title	Action recommended
246 (WRC-19)	Studies to consider possible allocation of the frequency band 3 600-3 800 MHz to the mobile, except aeronautical mobile, service on a primary basis within Region 1	Subject to WRC-23 agenda item 1.3.
247 (WRC-19)	Facilitating mobile connectivity in certain frequency bands below 2.7 GHz using high-altitude platform stations as International Mobile Telecommunications base stations	Subject to WRC-23 agenda item 1.4.
249 (WRC-19)	Study of technical and operational issues and regulatory provisions for space-to-space transmissions in the Earth-to-space direction in the frequency bands [1 610-1 645.5 and 1 646.5-1 660.5 MHz] and the space-to-Earth direction in the frequency bands [1 525-1 544 MHz], [1 545-1 559 MHz], [1 613.8-1 626.5 MHz] and [2 483.5-2 500 MHz] among non-geostationary and geostationary satellites operating in the mobile-satellite service	Modify or suppress as necessary based on the results of studies carried out for WRC-27 (preliminary WRC-27 agenda item 2.8)
250 (WRC-19)	Studies on possible allocations to the land mobile service (excluding International Mobile Telecommunications) in the frequency band 1 300-1 350 MHz for use by administrations for the future development of terrestrial mobile-service applications	Modify or suppress as necessary based on the results of studies carried out for WRC-27 (preliminary WRC-27 agenda item 2.9)
251 (WRC-19)	Removal of the limitation regarding aeronautical mobile in the frequency range 694-960 MHz for the use of International Mobile Telecommunications user equipment by non-safety applications	Modify or suppress as necessary based on the results of studies carried out for WRC-27 (preliminary WRC-27 agenda item 2.12)
339 (Rev.WRC-07)	Coordination of NAVTEX services.	No change
354 (WRC-07)	Distress and safety radiotelephony procedures for 2 182 kHz.	No change
356 (WRC-07)	ITU maritime service information registration.	No change

Resolution No.	Title	Action recommended
361 (<i>Rev.WRC-19</i>)	Consideration of regulatory provisions for modernization of the global maritime distress and safety system and related to the implementation of e-navigation.	Subject to WRC-23 agenda item 1.11.
405 (<i>Geneva 1979</i>)	Relating to the use of frequencies of the aeronautical mobile (R) service.	Subject to WRC-23 agenda item 1.9.
413 (<i>Rev.WRC-12</i>)	Use of the band 108-117.975 MHz by aeronautical service.	No change
417 (<i>Rev.WRC-12</i>)	Use of the frequency band 960-1 164 MHz by the aeronautical mobile (R) service.	No change
418 (<i>Rev.WRC-15</i>)	Use of the band 5 091-5 250 MHz by the aeronautical mobile service for telemetry applications.	No change
422 (<i>WRC-12</i>)	Development of methodology to calculate aeronautical mobile-satellite (R) service spectrum requirements within the frequency bands 1 545-1 555 MHz (space-to-Earth) and 1 646.5-1 656.5 MHz (Earth-to-space).	Suppress as a result of the approval of Recommendation ITU-R M.2091.
424 (<i>WRC-15</i>)	Use of wireless avionics intra-communications in the frequency band 4 200-4 400 MHz.	No change
425 (<i>Rev.WRC-19</i>)	Use of the frequency band 1 087.7-1 092.3 MHz by the aeronautical mobile-satellite (R) service (Earth-to-space) to facilitate global flight tracking for civil aviation.	No change
428 (<i>WRC-19</i>)	Studies on a possible new allocation to the aeronautical mobile-satellite (R) service within the frequency band 117.975-137 MHz in order to support aeronautical VHF communications in the Earth-to-space and space-to-Earth directions	Subject to WRC-23 agenda item 1.7.
429 (<i>WRC-19</i>)	Consideration of regulatory provisions for updating Appendix 27 of the Radio Regulations in support of aeronautical HF modernization	Subject to WRC-23 agenda item 1.9.
430 (<i>WRC-19</i>)	Studies on frequency-related matters, including possible additional allocations, for the possible introduction of new non-safety aeronautical mobile applications	Subject to WRC-23 agenda item 1.10.

Resolution No.	Title	Action recommended
608 (<i>Rev.WRC-19</i>)	Use of the frequency band 1 215-1 300 MHz by systems of the radionavigation satellite service.	No change
609 (<i>Rev.WRC-07</i>)	Protection of aeronautical radionavigation systems from the equivalent power flux-density produced by radionavigation satellite service networks and systems in the 1 164-1 215 MHz band.	No change
610 (<i>Rev.WRC-19</i>)	Coordination and bilateral resolution of technical compatibility issues for radionavigation satellite networks and systems in the band 1 164-1 300 MHz, 1 559-1 610 MHz and 5 010-5 030 MHz.	No change
612 (<i>Rev.WRC-12</i>)	Use of the radiolocation service between 3 and 50 MHz to support oceanographic radar operations.	No change
660 (<i>WRC-19</i>)	Use of the frequency band 137-138 MHz by non-geostationary satellites with short-duration missions in the space operation service.	No change
661 (<i>WRC-19</i>)	Examination of a possible upgrade to primary status of the secondary allocation to the space research service in the frequency band 14.8-15.35 GHz	Subject to WRC-23 agenda item 1.13.
705 (<i>Rev.WRC-15</i>)	Mutual protection of radio services operating in the band 70-130 kHz.	No change
729 (<i>Rev.WRC-07</i>)	Use of frequency adaptive systems in the MF and HF bands.	No change
748 (<i>Rev.WRC-19</i>)	Compatibility between the aeronautical mobile (R) service and the fixed satellite service (Earth-to-space) in the band 5 091-5 150 MHz.	No change
762 (<i>WRC-15</i>)	Application of power flux density criteria to assess the potential for harmful interference under No. 11.32A for fixed-satellite and broadcasting-satellite service networks in the 6 GHz and 10/11/12/14 GHz bands not subject to a plan.	No change

Resolution No.	Title	Action recommended
772 (WRC-19)	Consideration of regulatory provisions to facilitate the introduction of sub-orbital vehicles.	Subject to WRC-23 agenda item 1.6.
773 (WRC-19)	Study of technical and operational issues and regulatory provisions for satellite-to-satellite links in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8 20.2 GHz and 27.5-30 GHz	Subject to WRC-23 agenda item 1.17.
774 (WRC-19)	Studies on technical and operational measures to be applied in the frequency band 1 240-1 300 MHz to ensure the protection of the radionavigation-satellite service (space-to-Earth)	Subject to WRC-23 agenda item 9.1 topic b).

Recommendations:

Recommendation No.	Title	Action recommended
7 (Rev.WRC-97)	Adoption of standard forms for ship station and ship earth station licences and aircraft station and aircraft earth station licences.	No change
9	Relating to the measures to be taken to prevent the operation of broadcasting stations on board ships or aircraft outside national territories.	No change
71	Relating to the standardization of the technical and operational characteristics of radio equipment.	No change
75 (Rev.WRC-15)	Study of the boundary between the out-of-band and spurious domains of primary radars using magnetrons.	No change
401	Relating to the efficient use of aeronautical mobile (R) worldwide frequencies.	No change
608 (Rev.WRC-07)	Guidelines for consultation meetings established in Resolution 609 (WRC-07).	No change

WRC-23 agenda item 8

Agenda item title

8 to consider and take appropriate action on requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required, taking into account Resolution 26 (Rev.WRC-19);

Discussion

Allocations to the aeronautical services are generally made for all ITU regions and normally on an exclusive basis. These principles reflect the global process of standardization within ICAO for the promotion of safety and to support the global interoperability of radiocommunication and radionavigation equipment used in civil aircraft. In some instances, however, footnotes to the ITU Table of Frequency Allocations allocate spectrum in one or more countries to other radio services in addition or alternatively to the aeronautical service to which the same spectrum is allocated in the body of the table.

The use of country footnote allocations to non-aeronautical services in aeronautical bands is generally not recommended by ICAO, on safety grounds, as such use may result in harmful interference to safety services. Furthermore, this practice generally leads to an inefficient use of available spectrum to aeronautical services, particularly when the radio systems sharing the band have differing technical characteristics. It also may result in undesirable (sub-) regional variations with respect to the technical conditions under which the aeronautical allocations can be used. This can have a serious impact on the safety of aviation.

The following footnotes in aeronautical bands should be carefully reviewed by administrations in order to preserve the safety and efficiency of aeronautical services for the reasons as discussed below:

- a) In the frequency bands used for the ICAO instrument landing system (ILS), (marker beacons 74.8-75.2 MHz; localizer 108-112 MHz and glide path 328.6-335.4 MHz) and the VHF omnidirectional radio range system (VOR); 108-117.975 MHz, RR Nos. **5.181**, **5.197** and **5.259** allow for the introduction of the mobile service on a secondary basis and subject to agreement obtained under No. **9.21** of the Radio Regulations when these bands are no longer required for the aeronautical radionavigation service. The use of both ILS and VOR is expected to continue. In addition, WRC-03, as amended by WRC-07, has introduced RR No. **5.197A** stipulating that the band 108-117.975 MHz is also allocated on a primary basis to the aeronautical mobile (R) service (AM(R)S), limited to systems operating in accordance with recognized international aeronautical standards. Such use shall be in accordance with Resolution **413 (Rev.WRC-12)**. The use of the band 108-112 MHz by the AM(R)S shall be limited to systems composed of ground-based transmitters and associated receivers that provide navigational information in support of air navigation functions in accordance with recognized international aeronautical standards. ICAO encourages administrations listed in RR Nos. **5.181**, **5.197** and **5.259** to review their use and if no longer required, to remove their country's name from these footnotes.
- b) RR Nos. **5.201** and **5.202** allocate the frequency bands 132-136 MHz and 136-137 MHz in some States to the aeronautical mobile (off-route) service (AM(OR)S). Since these frequency bands are heavily utilized for ICAO-standard VHF voice and data communications, ICAO

encourages those concerned administrations to review their use and if no longer required, to remove their country's name from these footnotes.

- c) In the frequency band 1 215-1 300 MHz, which is used by civil aviation for the provision of radionavigation services through RR No. **5.331**. RR footnote No. **5.330** allocates the band in a number of countries to the fixed and mobile service. Given the receiver sensitivity of aeronautical uses of the frequency band, ICAO does not support the continued inclusion of an additional service through country footnotes. ICAO would therefore encourage administrations to review their use and if no longer required, to remove their country's name from RR No. **5.330**.
- d) In the frequency band 1 525-1 530 MHz, which is used by civil aviation for the provision of satellite services RR No. **5.352A** specifies that stations in the mobile-satellite service, except stations in the maritime mobile-satellite service, shall not cause harmful interference to, or claim protection from, stations of the fixed service in a number of countries that were notified prior to 1 April 1998. As of August 2020, the ITU Master International Frequency Register shows out of 20 administrations listed in this footnote, only 4 Administrations have fixed stations notified prior to 1 April 1998. ICAO would therefore encourage Administrations listed in the footnote to review their use of fixed service assignments in 1 525-1 530 MHz, and if no longer required, to remove their country's name from RR No. **5.352A**.
- e) In the frequency bands 1 540-1 559 MHz, 1 610.6-1 613.8 MHz and 1 613.8-1 626.5 MHz, within which some portions are assigned to or used by the aeronautical mobile-satellite (R) service, RR No. **5.355** also allocates the band on a secondary basis to the fixed service in a number of countries. Given that portions of these bands are utilized by a safety-of-life service, ICAO does not support the continued use of RR No. **5.355** country footnote. ICAO encourages those concerned administrations to review their use and if no longer required, to remove their country's name from RR No. **5.355**.
- f) In the frequency bands 1 550-1 559 MHz, 1 610-1 645.5 MHz and 1 646.5-1 660 MHz which are assigned to mobile-satellite services, including in some portions assignment to or use by the aeronautical mobile-satellite (R) service, RR No. **5.359** also allocates the bands to the fixed service on a primary basis in a number of countries. Given that portions of these bands are utilized by a safety-of-life service, ICAO does not support the continued use of RR No. **5.359** country footnote. ICAO would therefore encourage those concerned administrations to review their use and if no longer required, to remove their country's name from No. **5.359**.
- g) In the frequency band 4 200-4 400 MHz, which is reserved for use by airborne radio altimeters and wireless avionics intra-communications (WAIC), RR No. **5.439** allows the operation of the fixed service on a secondary basis in some countries. Radio altimeters are a critical element in aircraft automatic landing systems and serve as a sensor in ground proximity warning systems. WAIC provides aircraft safety communications between points on an airframe. Interference from the fixed service has the potential to affect the safety of both of these systems. ICAO would therefore encourage those concerned administrations to review their use and if no longer required, to remove their country's name from RR No. **5.439**.

ICAO Position

To encourage administrations listed in the footnotes to review RR Nos. **5.181**, **5.197** and **5.259**, as access to the frequency bands 74.8-75.2, 108-112 and 328.6-335.4 MHz by the mobile service is difficult and could create the potential for harmful interference to important radionavigation systems used by aircraft at final approach and landing as well as systems operating in the aeronautical mobile service in the frequency band 108-112 MHz.

To encourage administrations listed in the footnotes to review RR Nos. **5.201** and **5.202**, as use by the AM(OR)S of the frequency bands 132-136 MHz and 136-137 MHz in some States may cause harmful interference to current and future aeronautical safety communications.

To encourage administrations listed in the footnote to review RR No. **5.330** as access to the frequency band 1 215-1 300 MHz by the fixed and mobile services could potentially cause harmful interference to services used to support aircraft operations.

To encourage administrations listed the footnote to review RR No. **5.352A** as access to the frequency bands 1 525-1 530 MHz by the fixed services could potentially constrain aeronautical use of this frequency band.

To encourage administrations listed in the footnote to review RR No. **5.355** as access to the frequency bands 1 540-1 559, 1 610.6-1 613.8 and 1 613.8-1 626.5 MHz by the fixed services could potentially constrain aeronautical use of these frequency bands.

To encourage administrations listed in the footnote to review RR No. **5.359** as access to the frequency bands 1 550-1 559 MHz, 1 610-1 645.5 MHz and 1 646.5-1 660 MHz by the fixed services could potentially jeopardize aeronautical use of those frequency bands.

To encourage administrations listed in the footnote to review RR No. **5.439** to ensure the protection of the safety critical operation of radio altimeters and WAIC systems in the frequency band 4 200-4 400 MHz.

ICAO would encourage administrations to take appropriate actions under this agenda item to remove their country's name from these footnotes if no longer required.

Note 1.— Administrations indicated in the footnotes mentioned in the ICAO Position above which are urged to remove their country names from these footnotes are as follows:

No. 5.181 *Egypt, Israel and Syrian Arab Republic No.*

No. 5.197 *Syrian Arab Republic*

No. 5.201 *Armenia, Azerbaijan, Belarus, Bulgaria, Estonia, the Russian Federation, Georgia, Hungary, Iran (Islamic Republic of), Iraq (Republic of), Japan, Kazakhstan, Mali, Mongolia, Mozambique, Uzbekistan, Papua New Guinea, Poland, Kyrgyzstan, Romania, Senegal, Tajikistan, Turkmenistan and Ukraine*

No. 5.202 *Saudi Arabia, Armenia, Azerbaijan, Bahrain, Belarus, Bulgaria, the United Arab Emirates, the Russian Federation, Georgia, Iran (Islamic Republic of), Jordan, Mali, Oman, Uzbekistan, Poland, the Syrian Arab Republic, Kyrgyzstan, Romania, Senegal, Tajikistan, Turkmenistan and Ukraine*

No. 5.259 *Egypt and Syrian Arab Republic*

No. 5.330 *Angola, Bahrain, Bangladesh, Cameroon, Chad, China, Djibouti, Egypt, Eritrea, Ethiopia, Guyana, India, Indonesia, Iran (Islamic Republic of), Iraq, Israel, Japan, Jordan, Kuwait, Nepal, Oman, Pakistan, the Philippines, Qatar, Saudi Arabia, Somalia, Sudan, South Sudan, the Syrian Arab Republic, Togo, the United Arab Emirates and Yemen*

No. 5.355 *Bahrain, Bangladesh, Congo (Rep of the), Djibouti, Egypt, Eritrea, Iraq, Israel, Kuwait, Qatar, Syrian Arab Republic, Somalia, Sudan, South Sudan, Chad, Togo and Yemen*

No. 5.352A *Algeria, Saudi Arabia, Egypt, Guinea, India, Israel, Italy, Jordan, Kuwait, Mali, Morocco, Mauritania, Nigeria, Oman, Pakistan, the Philippines, Qatar, Syrian Arab Republic, Viet Nam and Yemen*

No. 5.359 *Germany, Saudi Arabia, Armenia, Azerbaijan, Belarus, Cameroon, the Russian Federation, Georgia, Guinea, Guinea-Bissau, Jordan, Kazakhstan, Kuwait, Lithuania, Mauritania, Uganda, Uzbekistan, Pakistan, Poland, the Syrian Arab Republic, Kyrgyzstan, the Dem. People's Rep. of Korea, Romania, Tajikistan, Tunisia, Turkmenistan and Ukraine*

No. 5.439 *Iran (Islamic Republic of)*

WRC-23 agenda item 9.1

Agenda item title

9 *to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the Convention;*

9.1 *on the activities of the Radiocommunication Sector since WRC-19:*

Note — The subdivision of WRC-23 agenda item 9.1 into topics, such as a), b), etc. was made at the first session of the Conference Preparatory Meeting for WRC-23 (CPM23-1) and is summarized in the BR Administrative Circular CA/251, 19th December 2019. In addition, a topic d) was added which was not part of Resolution 811 (WRC-19) (the WRC-23 agenda), however was agreed by WRC-19 (see WRC-19 Document 573 §§ 35.2 to 35.4).

Topic 9.1-a

In accordance with Resolution 657 (Rev.WRC-19), review the results of studies relating to the technical and operational characteristics, spectrum requirements and appropriate radio service designations for space weather sensors with a view to describing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services;

Space weather observations from ground-based networks of space weather sensor systems are becoming more and more important for the detection of solar activity that can harmfully affect the operation of international civil aviation. Solar events, such as large solar flares and coronal mass ejections (CMEs), produce magnetic storms that can present serious aviation safety risks. These events can cause major disruptions to the communications, navigation, and surveillance (CNS) systems critical to the operation of aircraft electronic systems and the aeronautical systems necessary to the safe operation of the airspace.

Data from Space Weather Sensors are provided to space weather forecast and warning centers around the world for many applications. Space weather advisories for international air navigation are provided to aircraft operators for planning mitigations to any potential risks. These forecasts and warnings also allow operators of aeronautical systems the opportunity to put in place mitigations to protect their systems and services. The Sun is the primary source of space weather of interest for spectrum management of civil aviation CNS systems. In addition, there are experimental research activities and other users of space weather sensor data that are not used by aviation.

Currently, space weather sensor systems are deployed in some countries and operate over a very large frequency range of approximately 10 kHz – 10 GHz based on existing ITU-R Reports. While space weather sensors systems may operate in a variety of frequency bands, these may not be the same between different countries as there is not a harmonized approach to the use of space weather sensors worldwide.

Within the ITU, some space weather sensors have been reported to operate in frequency bands that are critical to aircraft aeronautical communications, navigation, and surveillance. There are also active systems that operate in frequency bands used by aviation safety services on a non-interference basis. Some systems may not be used by ICAO to serve the purpose of space weather observation for flight planning and forecasting purposes.

ICAO Position

To support continuation of ITU-R studies and support appropriate recognition in the Radio Regulations of space weather sensors, provided that space weather systems do not impact current or planned aeronautical systems or applications.

Topic 9.1-b

Review the amateur service and the amateur-satellite service allocations in the frequency band 1 240-1 300 MHz to determine if additional measures are required to ensure protection of the radionavigation-satellite service (space-to-Earth) operating in the same band in accordance with Resolution 774 (WRC-19);

The amateur service has a secondary allocation in the frequency band 1 240-1 300 MHz (known as the “23 cm band” by the amateur community) and is currently used for amateur voice, data and image transmission. The frequency band is also allocated on a primary basis to the following services:

- Table Allocation
 - Earth exploration-satellite (active)
 - Radiolocation
 - Radionavigation Satellite (space-to-Earth) (space-to-space)
 - Space research(active).
- Footnote Allocation within various countries
 - 5.330 Fixed
 - 5.330 Mobile
 - 5.331 Radionavigation.

In the frequency band 1 240-1 300 MHz radionavigation satellite service (RNSS) systems such as GLONASS, Galileo, Beidou & QZSS are either operational, or becoming operational in various parts of the world with the expectation of enhancing the accuracy, reliability and positional accuracy of the current systems as well as offering additional features. However, there have been confirmed reports of harmful interference to the RNSS being caused by amateur service systems. This agenda item seeks to identify additional technical and operational measures that could be implemented to improve the protection of those RNSS from amateur and amateur-satellite systems operating under the secondary allocations to the amateur and amateur-satellite service without removing those amateur allocations.

Within the frequency band 1 240-1 300 MHz aviation currently operates primary surveillance radars used in the provision of air traffic control services. Past research has indicated that RNSS systems such as those indicated above can cause harmful interference to radars. The concern is that action taken under this agenda item could adversely affect the provision of those primary radar services with a consequential impact on air traffic control.

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ICAO Position

To ensure that any mitigation measures taken under this agenda item will not impact the protection of aeronautical radar systems operating under the existing aeronautical radionavigation or radiolocation service allocations.

WRC-23 agenda item 9.2

Agenda item title

9 to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the ITU Convention;

9.2 on any difficulties or inconsistencies encountered in the application of the Radio Regulations;¹

The relevant ITU-R working parties are invited to carry out the requested studies, indicated below, and to report the results of the studies to the Director of the Radiocommunication Bureau to be considered as the Director deems appropriate.

From Resolution **427 (WRC-19)** “Updating provisions related to aeronautical services in the Radio Regulations – *resolves to invite ITU-R* states “to study the Articles, limited to Chapters IV, V, VI and VIII of Volume I of the Radio Regulations and their associated Appendices, as appropriate, in order to identify outdated aeronautical provisions with respect to ICAO Standards and Recommended Practices and to develop examples of regulatory texts for updating these provisions, while ensuring that potential changes to such provisions will not impact any other systems or services operating in accordance with the Radio Regulations”. (Responsible Group: WP 5B).

ICAO Position

Any potential regulatory actions taken under this agenda item, should not affect current or planned aeronautical systems or applications.

¹ This agenda sub-item is strictly limited to the Report of the Director on any difficulties or inconsistencies encountered in the application of the Radio Regulations and the comments from administrations. Administrations are invited to inform the Director of the Radiocommunication Bureau of any difficulties or inconsistencies encountered in the Radio Regulations.

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WRC-23 agenda item 10

Agenda item title

10 to recommend to the Council items for inclusion in the agenda for the next WRC, and items for the preliminary agenda of future conferences, in accordance with Article 7 of the Convention and Resolution 804 (Rev. WRC-19)

Discussion

Resolution **812 (WRC-19)** contains the preliminary agenda for the 2027 World Radiocommunication Conference (WRC-27). Section 2.9 resolves: “*to consider possible additional spectrum allocations to the mobile service in the frequency band 1 300-1 350 MHz to facilitate the future development of mobile-service applications, in accordance with Resolution 250 (WRC-19)*”.

The frequency band 1 300-1 350 MHz is used by multiple ICAO Member States for various types of long-range radar systems that measure range, bearing, and velocity of aircraft, and perform missions critical to safe and reliable air traffic control (ATC) as considered in Resolution **250 (WRC-19)**. These radar systems ensure the safe transportation of people and goods, encourage the flow of commerce, and provide for State air surveillance requirements. Long-range radars are operated in this frequency band due to the minimal atmospheric effects such as loss from rain and fog, and the low external background noise levels.

While Resolution **250 (WRC-19)** resolves to conduct sharing and compatibility studies to ensure protection of existing services to which the frequency band is allocated on a primary basis, the studies performed to date have not shown any potential for compatibility with the systems operated in this band. Furthermore, studies under WRC-15 agenda item 1.1 with IMT and the same incumbent radar systems demonstrated that co-frequency sharing was not possible. Therefore, there is significant concern for a new WRC-27 agenda item to add a Mobile Service allocation to the 1 300-1 350 MHz band that causes harmful interference to these incumbent radar systems and the potential for harm to public safety.

ICAO Position

To oppose a new agenda item for WRC-27 for an additional spectrum allocation to the mobile service in the frequency band 1 300-1 350 MHz.

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