International Civil Aviation Organization

Twenty Eighth Meeting of the Communications/ Navigation and Surveillance Sub-group (CNS SG/28) of APANPIRG

Bangkok, Thailand, 01-05 July 2024

Agenda Item 5: Aeronautical Mobile Communications Service and Aeronautical electromagnetic spectrum utilization

5.3 Outcomes of ITU WRC-23

REVIEW OF THE REPORT ON THE RESULTS OF THE INTERNATIONAL TELECOMMUNICATION UNION (ITU) WORLD RADIOCOMMUNICATION CONFERENCE (2023) (WRC-23)

(Presented by the Secretariat)

SUMMARY

This working paper is reproduced from ANB Working Paper AN-WP/9721 for Air Navigation Commission, which presented a report to Council on addressing the results of the International Telecommunication Union (ITU) World Radiocommunication Conference (2023) (WRC-23) (20 November to 15 December 2023, Dubai, United Arab Emirates) for information and action.

1. INTRODUCTION

1.1 The International Telecommunication Union (ITU) World Radiocommunication Conference (2023) (WRC-23) was held from 20 November to 15 December 2023 in Dubai, United Arab Emirates. In total, about 4 000 delegates from 163 ITU Member States and 165 other entities, including international organizations and industry, participated in the work of the conference.

2. DISCUSSION

RESULTS OF THE CONFERENCE ON THE AGENDA ITEMS RELATED TO INTERNATIONAL CIVIL AVIATION

2.1 The WRC-23 results fully conformed to the ICAO Position. A report to Council contained in the attached **Appendix A** presents the results of the five WRC-23 agenda items for which aviation was seeking specific actions by WRC-23, as follows:

a) WRC-23 Agenda Item 1.6: Regulatory provisions to facilitate radiocommunications for sub-orbital vehicles.

b) WRC-23 Agenda Item 1.7: A new AMS(R)S allocation for aeronautical VHF communications in all or part of the frequency band 117.975 – 137 MHz, while preventing any undue constraints on existing aeronautical VHF systems.

c) WRC-23 Agenda Item 1.8: Appropriate regulatory actions, with a view to reviewing and, if necessary, revising Resolution 155 to accommodate the use of fixed-satellite service networks by RPAS C2 Links.

d) WRC-23 Agenda Item 1.9: Review and update of Appendix 27 to the Radio Regulations to accommodate digital technologies for aviation safety-of-life applications in existing HF bands.

e) WRC-23 Agenda Item 9.2: To consider and approve the report of the Director of the Radiocommunication Bureau; on any difficulties or inconsistencies encountered in the application of the Radio Regulations.

Note. – Deliberations under this agenda item are related to GNSS interference.

2.2 In addition to the above items, WRC-23 had a large number of agenda items with potential positive or negative implications to aviation.

2.3 It can be concluded that active engagement by ICAO experts and the aviation community before and during the conference made it possible to counter and refute numerous proposals which could have adversely impacted aeronautical spectrum, thus ensuring that WRC-23 provided the aviation community with the best solutions possible.

2.4 In order to derive the benefit facilitated by the outcome of the WRC, there will be further actions required in terms of development of ICAO SARPs and technical provisions, and in terms of supporting studies within the ITU Radiocommunication Sector.

2.5 A preliminary list of WRC-27 agenda items of prime interest to aviation, including Secretariat commentary, is also included in the report to Council, as contained in the attached Appendix. Although there are no specific items on the agenda of WRC-27 through which aviation is seeking new spectrum for the provision of aeronautical safety services, there are numerous items as a consequence of which existing spectrum for the provision of such services could be negatively affected.

2.6 Taking account of the successful outcome of WRC-23, it should be noted that a significant element in the ICAO preparatory activities for this conference was the early awareness and involvement of Member States in the development of the ICAO Position. The Secretariat, assisted by the Frequency Spectrum Management Panel (FSMP), will place a high priority on the development of the ICAO Position for the WRC-27 in full coordination with other relevant bodies and taking due account of spectrum management activities in the regions.

2.7 In view of the foregoing the meeting is invited to endorse the Draft Conclusion proposed by SRWG/8, with reference to **paragraph 2.4** of **WP08** of this meeting, to initiate actions for timely and effective preparation for WRC-27 in APAC region.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the results of the ITU WRC-23 provided in the report contained in the attached **Appendix A**, in particular the **CONCLUSION** provided in Section 5;

b) note that ANC was requested to place a high priority on the development of the ICAO Position for the WRC-27, in full coordination with other relevant bodies, taking due account of spectrum management activities in the regions;

c) urge States/Administrations to nominate experts to participate in the WRC-27 workshop (24-25 February 2025), SRWG/9 (26-28 February 2025) and FSMP WG/20 (26 February to 7 March 2025) at ICAO APAC Regional Office; and

d) discuss any relevant matter as appropriate.

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International Civil Aviation Organization

Info Report C231/ANB/1

COUNCIL — 231ST SESSION

THE REPORT ON THE RESULTS OF THE INTERNATIONAL TELECOMMUNICATION UNION (ITU) WORLD RADIOCOMMUNICATION CONFERENCE (2023) (WRC-23)

(Presented by the President of the Air Navigation Commission)

EXECUTIVE SUMMARY

This report presents the results of the International Telecommunication Union (ITU) World Radiocommunication Conference (2023) (WRC-23) (20 November to 15 December 2023, Dubai, United Arab Emirates), highlighting mainly the detailed result of the five WRC-23 agenda items for which aviation was seeking specific actions by WRC-23.

Active engagement by ICAO experts and the aviation community before and during the conference made it possible to counter and refute numerous proposals which could have adversely impacted aeronautical spectrum, thus ensuring that WRC-23 provided the aviation community with the best solutions possible. In order to derive the benefit facilitated by the outcome of the WRC, there will be further actions required in terms of development of ICAO SARPs and technical provisions, as described in Section 3 and in terms of supporting studies within the ITU Radiocommunication Sector.

Taking account of the successful outcome of WRC-23, it should be noted that a significant element in the ICAO preparatory activities for this conference was the early awareness and involvement of Member States in the development of the ICAO Position. The Secretariat, assisted by the Frequency Spectrum Management Panel (FSMP), will place a high priority on the development of the ICAO Position for the WRC-27 in full coordination with other relevant bodies and taking due account of spectrum management activities in the regions.

Strategic Objectives:	This information paper relates to the Strategic Objectives for Safety and Air Navigation Capacity and Efficiency.
Financial implications:	There is a cost to the necessary engagement by States and industry on the issue.
References:	C-WP/15486 C-WP/15199 C-Min.229/3 C-Min.223/6 AN-WP/9395 AN Min. 225-x Doc 10184, *Assembly Resolutions in Force (as of 7 October 2022)* Doc 9718, *Handbook on Radio Frequency Spectrum Requirements for Civil Aviation, Volume I – ICAO spectrum strategy, policy statements and related information*

	State letter E 3/5-23/60 State letter E 3/5-21/37

1. INTRODUCTION

1.1 The International Telecommunication Union (ITU) World Radiocommunication Conference (2023) (WRC-23) was held from 20 November to 15 December 2023 in Dubai, United Arab Emirates. The ICAO delegation to the conference included an RO/CNS, ICAO WACAF Office (first two weeks), an RO/CNS, ICAO ESAF Office (third and fourth week), C/CNSS (full time) and two TOs/CNSS from Headquarters (one full time and one for the second and third week).

1.2 In total, about 4 000 delegates from 163 ITU Member States and 165 other entities, including international organizations and industry, participated in the work of the conference.

1.3 Four formal aviation coordination meetings were organized by the ICAO delegation during the conference and were attended by up to 55 people each. Coordination and promotion of the ICAO policy during the conference was also performed on a bilateral basis, including individuals, various industry groups and representing spectrum administrations.

2. BACKGROUND

2.1 Frequency spectrum is a finite and limited resource, managed by the ITU through its WRCs which are held approximately every four years. Availability of the necessary radio frequency spectrum is a critical prerequisite for the safety of civil aviation and the effective implementation of the communications, navigation and surveillance/air traffic management (CNS/ATM) systems. However, as demand for radio spectrum from non-aviation users continues to grow, aviation faces an ever-increasing competition for the limited available spectrum, in particular from mobile and broadband wireless access services. It is essential that aviation requirements for radio frequency spectrum be strongly supported by all ICAO Member States in all international fora where spectrum allocations are addressed to ensure that aviation requirements for safety of life services are duly presented and understood.

2.2 ICAO policies and practices related to radio frequency spectrum matters are outlined in Assembly Resolution A41-7 "*Support of the ICAO policy on radio frequency spectrum matters*", which urges ICAO Contracting States, international organizations and other civil aviation stakeholders to support aviation requirements for spectrum and instructs ICAO to make sufficient resources available to enable increased participation in spectrum management activities.

2.3 Summary of the main significant efforts made during the lead up to WRC-23

2.3.1 Development and distribution of the ICAO Position:

a) initially developed in 2020 by the Frequency Spectrum Management Panel (FSMP), reviewed by the Air Navigation Commission (ANC) (215-7), reviewed by States before a final review by the Commission (217-2), approved by Council (223/6) on 14 June 2021 and sent to States (State letter E 3/5-21/37);

b) subsequent update by the FSMP to reflect the progress of studies within ITU and the FSMP, reviewed by the Commission (223-3), approved by Council (229/3) on 16 June 2023 and sent to States (State letter E 3/5-23/60); and

c) ICAO Position submitted to the ITU WRC-23 on 27 July 2023.

2.3.2 ICAO Secretariat preparatory activities (meetings and missions) to promote the ICAO Position and spectrum policy to secure adequate support in the preparatory work leading up to WRC-23:

a) support of ITU-Radiocommunication Sector (ITU-R) work activities, including ITU-R Study Groups 4 and 5, Working Parties 4C and 5B, CPM-23/2, RA-23 and ITU-R workshops; on average ten work-weeks per year;

b) support of the WRC-23 preparatory activities of regional telecommunication organizations[1]; on average four work-weeks per year; and

c) meetings of the FSMP in conjunction with frequency spectrum workshops for aviation professionals in the ICAO regional offices; on average six work-weeks per year.

3. RESULTS OF THE CONFERENCE ON THE AGENDA ITEMS RELATED TO INTERNATIONAL CIVIL AVIATION

3.1 WRC-23 Agenda Item 1.6: Regulatory provisions to facilitate radiocommunications for sub-orbital vehicles

3.1.1 Sub-orbital vehicles, including space planes, have been developed to reach altitudes and velocities that are much higher than those of conventional aircraft. Re-usable sub-orbital vehicles that launch like traditional rockets have become routine. Depending on their flight characteristics and mission profiles, sub-orbital vehicles may use several different terrestrial and space services operating in various ranges of frequency bands, some of those relating to aviation safety and standardized by ICAO. A sub-orbital vehicle could share airspace with conventional aircraft during certain portions of its flight and may need to be separated procedurally to maintain airspace safety. Therefore, depending on the flight profile of the sub-orbital vehicle, and as decided by the Member States, there may be a need in some cases for that vehicle to communicate with other airspace users and air traffic control.

3.1.2 The outcome of WRC-23 preparatory studies indicates that, in principle from a technical perspective, certain ICAO systems should have the capability to provide suitable radio links for sub-orbital vehicles to operate safely except in regions where communication blackouts are experienced. A current potential update to Annex 10 SARPs, relating to automatic dependent surveillance — broadcast (ADS-B) was recently approved by the fifth meeting of the Surveillance Panel (SP/5) held in 2023 and will be reviewed shortly by the ANC. This update, will, inter-alia, facilitate ADS-B being broadcast from sub-orbital vehicles at up-to low-Earth orbit elevations, to be used by for the safe integration of sub-orbital vehicles into conventional airspace.

3.1.3 WRC-23 deliberations under this agenda item were mainly two-fold. An attempt at defining the term *sub-orbital* in terms of lower and upper ceiling of operations failed due to lack of consensus on a legal definition of "space" and a consequential boundary between "terrestrial" and "space". An attempt was made to determine which potential radiocommunication systems should be studied for a future WRC. This also failed to reach a consensus.

3.1.4 The overall result of this agenda item was no change to the RR by WRC-23 and no further studies are to be undertaken on the issue. With the exception of ADS-B, no use-cases of other potential ICAO standardized safety systems were identified during the deliberations. Regarding ADS-B, this result does not impact its future use by sub-orbital vehicles, as being further determined by the SARPs currently under development. The new SARPs will ensure safe integration of sub-orbital vehicles into airspace

[1] African Telecommunication Union (ATU), Asia-Pacific Telecommunity (APT), European Conference of Postal and Telecommunications Administrations (CEPT), Inter-American Telecommunication Commission (CITEL).

where conventional aircraft operate. Hence the outcome fully satisfies the ICAO Position.

3.2 **WRC-23 Agenda Item 1.7: A new AMS(R)S allocation for aeronautical VHF communications in all or part of the frequency band 117.975 – 137 MHz, while preventing any undue constraints on existing aeronautical VHF systems**

3.2.1 The use of low-Earth orbiting satellites for very high frequency (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 operating under the aeronautical mobile (route) service (AM(R)S). Additionally, facilitating the use of the existing VHF radios onboard aircraft in oceanic and remote regions, low-Earth orbiting satellites operating under the aeronautical mobile satellite (route) service (AMS(R)S) could be used to complement the low-Earth orbiting satellite-based ADS-B systems already operational in those regions.

3.2.2 The conference agreed to allocate the full frequency band 117.975 – 137 MHz to the AMS(R)S in a manner which ensures no constraints on existing aeronautical VHF voice and datalink systems operating in the band. Coordination of new AMS(R)S assignments is required, in accordance with **No. 9.11A**[2] of the RR. In addition, a new Resolution **[COM4/2] (WRC-23)** requires that notifying administrations for new assignments using the AMS(R)S in this band take full account of relevant ICAO frequency planning procedures (see Annex 10, Volume V and Doc 9718, Volume II).

3.2.3 Addressing the potential lack of oversight by the ICAO coordination process to take account of frequencies in use by the aeronautical mobile (off-route) service (AM(OR)S) in accordance with RR footnotes **5.201** and **5.202**, further conditions are laid out in the Resolution, specifying a power-flux-density value to trigger coordination of potential new assignments to the AMS(R)S, in the case those assignments are to be operated over the territory of countries operating the AM(OR)S, while conversely also requiring States intending to take new AM(OR)S assignments into use to take due account of frequencies coordinated for AMS(R)S use.

3.2.4 Addressing a concern that satellite-based aeronautical VHF Digital Link Mode 2 stations operating on the common signaling channel at 136.975 MHz, very-close-adjacent to the upper band edge, may interfere with or receive occasional interference from the meteorological satellite service or the space-operations service operating above 137 MHz, conditions were laid out specifying the maximum allowable out-of-band emissions by satellites in the new AMS(R)S service and a requirement was imposed on the VHF AMS(R)S satellite receiver to be resilient to a specific interference environment, given as a table of power levels and associated percentage(s) of time detailing the worst case expected out-of-band emissions from those adjacent band satellite services.

3.2.5 While the new footnote associated with the AMS(R)S allocation requires assignments to be made in accordance with international aeronautical standards, the new Resolution **[COM4/2] (WRC-23)** also stipulates that the new allocation may be used by experimental AMS(R)S systems during the time-period that relevant SARPs are being developed.

3.2.6 The radio regulatory solution developed by the conference is not only fully in line with the ICAO Position, it can also be seen as the best possible outcome for aviation, it provides access by the new AMS(R)S to the full band 117.975-137 MHz avoiding any frequency band segmentation, and it avoids overly complex additional coordination rules within the ITU regulatory framework.

3.2.7 A substantive task is foreseen for the FSMP and the Communications Panel – Data Communications Infrastructure Working Group (CP-DCIWG), to develop SARPs and technical provisions to accommodate the new satellite-based VHF operations. This will also include work to develop

[2] With certain limitations, such as: RR No. 9.16 does not apply.

new coordination procedures to be used by the ICAO frequency assignment planning and coordination software "Frequency Finder".

3.3 WRC-23 Agenda Item 1.8: Appropriate regulatory actions, with a view to reviewing and, if necessary, revising Resolution 155 to accommodate the use of fixed-satellite service networks by RPAS C2 Links

3.3.1 Existing satellite networks operating in the fixed satellite service (FSS) have sufficient spectrum capacity to meet the requirements for beyond line-of-sight communication links and could be used for the provision of C2 link for remotely piloted aircraft systems (RPAS) provided that certain conditions can be fulfilled. State operated RPAS have been using C2 links operated by networks in the FSS in segregated airspaces for several years. However, such operations in non-segregated airspaces without an appropriate regulatory framework for spectrum use are difficult to coordinate and may pose a risk to other airspace users.

3.3.2 Seeking spectrum for the remotely piloted aircraft systems (RPAS) C2 link has been an unusually long-standing item within the ITU WRC process. WRC-07 (2007) established an agenda item for WRC-12 (2012) to allocate spectrum for the C2 link. WRC-12 was successful in repurposing portions of the aeronautical C-band (5 030 – 5 150 MHz, previously allocated for sole use by the microwave landing system), thus allocating suitable spectrum for the line-of-sight (LOS) link and some potential spectrum for the beyond-line-of-sight link (BLOS). WRC-12 attempted also to allocate spectrum in the FSS for C2 link BLOS use, however the issue of how to accommodate a *safety service* using the FSS could not be resolved.

3.3.3 **Article 40** of the ITU Constitution addresses "*... priority to all telecommunications concerning safety of life at sea, on land, in the air or in outer space…*". As a result of this article, aeronautical *safety services*, such as AM(R)S and AMS(R)S, normally have priority above that of other radiocommunication services (primary and secondary), both during any frequency assignment coordination process and during cases of interference resolution (also ref. **No. 4.10** of the RR). To address the *safety service* issue, WRC-15 (2015) developed Resolution **155** (further modified by WRC-19 (2019)), with the aim of enabling existing satellite networks operating in the FSS in the frequency bands at 14/12 GHz (Ku-band) and 30/20 GHz (Ka-band) to be used for the RPAS C2 link, without negatively affecting the frequency coordination of the FSS networks. While not providing a traditional AMS(R)S, the Resolution introduces an application into the FSS in a manner which creates a safety-assurance-obligation for RPAS operators intending to use those frequency bands for operations with safety-of-life implications and a corresponding safety-oversight obligation for the aeronautical regulator. Further, WRC-15 provided an instruction to ICAO to report to WRC-23 (2023) on the progress of developing SARPs to the conditions provided in Resolution **155**.

3.3.4 The solution provided by WRC-15, allocating certain frequency bands of the FSS against a footnote in the RR, specifying that the conditions of Resolution **155** shall apply, has been controversial for spectrum regulators and satellite operators as well as aviation regulators and industry. By some spectrum regulators this solution has been seen as a failure to properly address within the RR the priority-obligation to be given to radiocommunication services associated with safety. Some satellite operators have expressed concern that any notion of a safety issue, if not neutralized completely in the Resolution, may imbalance FSS spectrum negotiations between satellite operators. Some aviation regulators and industry have highlighted that a solution which does not expressly provide spectrum usage conditions consistent with a *safety service* may be an unacceptable risk to aviation as a whole, that radio-regulatory safety assurance obligations for other aeronautical spectrum could be eroded, as a consequence.

3.3.5 The RPAS Panel (RPASP) of the ANC, addressing the conditions specified in Resolution **155**, has developed a number of C2 link related SARPs, the first of which were adopted in March 2021 (applicable in 2026). Although generic to any technology, the SARPs leverage principles of safety management system oversight and procedures, including a requirement to the FSS operator (and

any other C2 link service provider) to perform real-time monitoring, estimation and prediction of interference risks, to plan solutions for potential harmful interference scenarios and act immediately when their attention is drawn to any harmful interference. Of note are SARPs which require the FSS operator to inform the RPAS operator before making any changes to the service they are providing as a result of coordination activity between FSS operators. Details on the relevant SARPs development, as reported to WRC-23 can be found at this link: https://www.icao.int/safety/FSMP/Documents/ITU-WRC23/Report_To_WRC-23_Status_Of_C2_Link_SARPS_R23-WRC23-C-0004!A7!MSW-E.docx.
It was noted during the conference that the development of a full and mature set of SARPs for the RPAS C2 link has not been completed yet.

3.3.6 The ICAO Position for WRC-23, was to support a modification to Resolution **155 (Rev. WRC-19)** addressing some inconsistencies and shortcomings of the Resolution. However, during WRC-23, a majority of States (and some aviation industry members) indicated support for suppressing the Resolution (and the footnote in the table of allocations that refers to it) instead. This would have been an unfortunate outcome, as it would likely have resulted in a non-harmonized approach by States, due to non-availability of a suitable international regulatory framework, within ITU and ICAO, to support the BLOS C2 link for RPAS.

3.3.7 During the final days of the conference, a consensus was reached, whereas it was decided to suspend any further action on Resolution **155 (Rev.WRC-19)** until decided by a future competent WRC. To this effect, a new item was agreed (to be addressed under Agenda Item 6 of WRC-27) to study, as a matter of urgency, necessary measures to facilitate the operation of earth stations on board unmanned aircraft used for C2 links, operated in non-segregated airspace using satellite links by the AMS(R)S in suitable frequency bands in order to decide on the appropriate course of action to be taken for WRC-31. Further to this effect, ITU-R was instructed to take necessary actions to implement this decision and Administrations were invited to contribute to the studies.

3.3.8 Given the consensus decision above, it is now essential that the RPASP, the FSMP and the ICAO Secretariat actively contribute to this study within ITU-R. If at all possible, a positive outcome of this study would be the identification and allocation of suitable and duly protected AMS(R)S spectrum, in a manner consistent with the traditional definition and use of the term *safety service* within the RR. This would be optimal for aviation community. If this is found not to be possible, Resolution **155** will need to be readdressed, preferably by WRC-31, to eliminate any ambiguities and inconsistencies therein.

3.4 WRC-23 Agenda Item 1.9: Review and update of Appendix 27 to the Radio Regulations to accommodate digital technologies for aviation safety-of-life applications in existing HF bands

3.4.1 High Frequency (HF) 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 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.

3.4.2 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, allow the aggregation of independent 3 kHz channels (either contiguous or non-contiguous) into wideband links. In order to take advantage of the various benefits that a modern wideband HF communication system could offer, minor changes were made to Appendix **27** of the RR, to allow the introduction of new digital wideband systems, using a combination of multiple 3 kHz channels to provide improved data rates. This result fully satisfies the ICAO Position.

3.5 **WRC-23 Agenda Item 9.2: To consider and approve the report of the Director of the Radiocommunication Bureau; on any difficulties or inconsistencies encountered in the application of the Radio Regulations**

3.5.1 Under this agenda item, the aviation community expected WRC-23 to identify outdated radioregulatory provisions with respect to ICAO SARPs. However, potentially due to the impact of the Covid-19 Pandemic, preparatory work before WRC-23 to address this agenda item did not progress well. Hence no modifications of aeronautical provisions under Chapters IV, V, VI and VIII of the RR were addressed by the conference.

3.5.2 Another aviation related issue was addressed, however, during the final months of WRC-23 preparations, namely the escalation of jamming and spoofing of global navigation satellite systems (GNSS) observed in recent years. The Navigation Systems Panel (NSP) and the FSMP developed a skeleton draft Resolution, which was in turn progressed to relevant meetings of ITU-R and regional spectrum management organizations. The outcome of this work resulted in a new ITU Resolution **[COM5/5] (WRC-23)** on the "*Prevention and mitigation of harmful interference to the radionavigation-satellite service (RNSS) in the frequency bands 1 164 – 1 215 MHz and 1 559 – 1 610 MHz*". The Resolution urges administrations "*to apply necessary measures to avoid the proliferation, circulation and operation of unauthorized transmitters that cause or have the potential to cause harmful interference to RNSS systems and networks operating in the frequency bands 1 164 – 1 215 MHz and 1 559 – 1 610 MHz…*".

3.5.3 While this outcome is very positive, it should be noted however that the Resolution also includes the following text in its *resolves*: *"…without prejudice to the right of administrations to deny access to RNSS, for security or defence purposes…*", which highlights vulnerability of the RNSS[3] whenever there is military conflict. Further, it serves as a reminder to civil aviation that alternative positioning, navigation and timing (APNT) solutions such as distance measuring equipment (DME) and its potential successors need to be maintained/developed and that it is unwise for aeronautical safety spectrum allocations (for example, AM(R)S, AMS(R)S and the aeronautical radionavigation service (ARNS)) to be shared with allocations which provide RNSS (GNSS) services.

3.6 **WRC-23: Other relevant agenda items**

3.6.1 Other aviation relevant WRC-23 agenda items included: 1.1, 1.2, 1.3, 1.4, 1.10, 1.11, 1.13, 1.15, 1.16, 1.17, 4, 8, and 9.1 topics a and b, and 10. The outcome of all these items satisfied the ICAO Position. The full "Provisional Final Acts" of WRC-23 can be found at this link: R-ACT-WRC.15-2023-PDF-E.pdf (itu.int).

4. AGENDA FOR WRC-27 (2027), AS AGREED BY WRC-23

4.1 It is already evident that the WRC-27 study cycle will be very busy. Although there are no specific items through which aviation is seeking new spectrum for the provision of aeronautical safety services, there are numerous items as a consequence of which existing spectrum for the provision of such services could be negatively affected.

4.2 A preliminary list of WRC-27 agenda items of prime interest to aviation, including Secretariat commentary is included below:

- **WRC-27 Agenda Item 1.7:** *to consider studies on sharing and compatibility and develop technical conditions for the use of International Mobile Telecommunications (IMT) in the*

[3] Global Navigation Satellite Systems (GNSS) operate within the Radionavigation Satellite Service (RNSS)

frequency bands 4 400 – 4 800 MHz, 7 125 – 8 400 MHz (or parts thereof), and 14.8 – 15.35 GHz taking into account existing primary services operating in these, and adjacent, frequency bands, in accordance with Resolution ***COM6/26 (WRC-23)***

Commentary: The frequency band 4 400 – 4 800 MHz is immediately adjacent to the Radio Altimeter (RA) band, 4 200 – 4 400 MHz. The RA are very vulnerable to out-of-band emissions from high powered IMT base stations. While the RA SARPs currently under development will provide considerable improvement to adjacent band interference rejection, the next generation RA will still be vulnerable to adjacent band transmissions when close to the 4 400 MHz band-edge. The new RA SARPs are expected to be available no earlier than 2027. This may be too late to facilitate ITU-R preparatory studies for WRC-27. The WRC-27 preparatory studies for this very difficult item will be undertaken by ITU-R Working Party 5D (WP5D) which is responsible for the terrestrial component of the IMT. Aviation has not participated previously in WP5D studies.

- **WRC-27 Agenda Item 1.9:** *to consider appropriate regulatory actions to update Appendix* ***26*** *to the Radio Regulations in support of aeronautical mobile (OR) high frequency modernization, in accordance with Resolution* ***COM6/2 (WRC-23)***

  Commentary: While not addressing an aeronautical safety band, this item is related to WRC-23 Agenda Item 1.9 and could potentially provide benefit to communications for *regularity of flight*. During the WRC-27 preparatory cycle studies on this item will be undertaken by ITU-R Working Party 5B (WP5B) which addresses aeronautical, maritime and radiodetermination items.

- **WRC-27 Agenda Item 1.19:** *to consider possible primary allocations in all Regions to the Earth exploration-satellite service (passive) in the frequency bands 4 200 – 4 400 MHz and 8 400 – 8 500 MHz, in accordance with Resolution* ***COM4/8 (WRC-23)***

  Commentary: This agenda item addresses the frequency band 4 200 – 4 400 MHz used by the aeronautical RA. A potential consequence of this agenda item could be to worsen the radio-regulatory conditions for the RA. During the WRC-27 preparatory cycle studies on this item will be undertaken by ITU-R Working Party 7C (WP7C) which covers remote sensing applications in the earth exploration-satellite-service. Aviation has not participated previously in WP7C studies.

- **WRC-27 Agenda Item 6:** *to identify those items requiring urgent action by the radiocommunication study groups in preparation for the next world radiocommunication conference*

  Commentary: While Agenda Item 6 does not itemize specific study items, this is where "*urgent studies*" identified by a previous WRC are addressed when not associated with a specific agenda item. The study to identify potential AMS(R)S candidate bands for C2 link, as referred in paragraphs 3.3.8 and 3.3.9 will most likely be undertaken by ITU-R Working Party 4C (WP4C) which addresses mobile satellite services, potentially assisted by WP5B.

4.3 Other WRC-27 Agenda Items of prime interest to aviation include: 1.11, 1.12, 1.13, 4 and 8. When developing the Position for WRC-27, FSMP may find additional items of interest.

5. CONCLUSION

5.1 While compared to some previous WRCs, WRC-23 had a large number of agenda items with potential positive or negative implications to aviation, the WRC-23 results fully conformed to the ICAO Position.

5.2 This WP focusses mainly on the detailed result of the five WRC-23 agenda items for which aviation was seeking specific actions by WRC-23 (see Section 3). For all items it can be concluded that active engagement by the ICAO experts and aviation community, before and during the conference, made it possible to counter and refute numerous proposals which would have had the potential to adversely impact aeronautical spectrum, thus ensuring that WRC-23 provided the aviation community with the best solutions possible. In order to derive the benefit facilitated by the outcome of some agenda items, there will be further actions required in terms of development of ICAO SARPs and technical provisions. Taking account of the agenda items identified by the conference for WRC-27 (2027) it is already evident that the study cycle for that conference will be very busy. As before, a positive outcome by WRC-27 will require active contributions and participation by the ICAO Secretariat and FSMP, supported by civil aviation authorities and industry. Furthermore, as illustrated in the conclusions for WRC-23 agenda item 1.8, aviation will need to participate actively in a new study within ITU-R to identify potential suitable and duly protected AMS(R)S spectrum for RPAS C2 link.

5.3 Taking account of this successful outcome from WRC-23, it should be noted that a significant element in the ICAO preparatory activities for this conference was the early awareness and involvement of Member States in the development of the ICAO Position. Major factors contributing to this achievement included:

a) the early development and dissemination of the draft ICAO Position by the Secretariat and the ANC, assisted by the FSMP;

b) the active participation by ICAO experts in the preparatory work of the ITU, including the relevant meetings of the ITU-R (for example, Study Groups 4 and 5, including relevant working parties, and the Conference Preparatory Meeting (CPM));

c) the active participation by ICAO experts in the meetings of regional telecommunication organizations (APT, CEPT, CITEL, ATU). The involvement and assistance of the regional offices proved important in supporting the development of proposals by the regional telecommunication organizations to the conference which were in line with the ICAO Position;

d) the organization of the FSMP working group meetings and ICAO radio frequency workshops in the ICAO regions;

e) the implementation of Assembly Resolution A41-7; and

f) the active participation of the ICAO delegation at the conference itself, during which the ICAO Position was often challenged, allowed ICAO to counter and refute numerous proposals that would adversely impact aeronautical spectrum.

5.4 An expeditious start of the ICAO preparatory activities for the next conference in 2027 is now essential. The FSMP will develop an initial draft of the ICAO Position by the end of 2024. A final review of the ICAO Position by the Commission, and a subsequent approval by the Council, is foreseen by mid-2025.

Junrong Liang

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