International Civil Aviation Organization

Twenty Fourth Meeting of the Communications/ Navigation and Surveillance Sub-group (CNS SG/24) of APANPIRG

Web-conference, 30 November – 4 December 2020

Agenda Item 4: Aeronautical Mobile Communications Service and Aeronautical electromagnetic spectrum utilization

4.2 Review outcomes of the ITU World Radiocommunication Conference 2019 (WRC-19);

REPORT ON THE RESULTS OF THE INTERNATIONAL TELECOMMUNICATION UNION (ITU) WORLD RADIOCOMMUNICATION CONFERENCE (2019) (WRC-19)

(Presented by the Secretariat)

SUMMARY

Radio frequency spectrum is a critical component of infrastructure that serves all aeronautical communications, navigation and surveillance/air traffic management (CNS/ATM) services and is protected as a safety-of-life function under the Radio Regulations. It is imperative that the global aviation community retains interference-free access to sufficient radio frequency spectrum in order to maintain safe implementation and operation of the CNS/ATM systems.

The International Telecommunication Union (ITU) World Radiocommunication Conference (WRC) serves as the preeminent event for negotiating long-term frequency spectrum rights. This paper summarizes the discussions and results from ITU WRC-19 (held 28 October to 22 November 2019 in Sharm el Sheikh, Egypt). In general, the conference results conformed to the ICAO Position. It is now essential to form an expeditious start of the ICAO preparatory activities for the next conference in 2023.

This paper is reproduced from the information paper C-WP/14994 presented by the President of the Air Navigation Commission to the Council - 219th Session. The Air Navigation Commission recommends that Council note the conclusions in paragraph 5.

1. INTRODUCTION

1.1 On 6 February 2020, the Air Navigation Commission (AN Min. 213-5) conducted its review of the results of the International Telecommunication Union (ITU) World Radiocommunication Conference (2019) (WRC-19) and requested that a Council information paper be prepared on the subject.

1.2 The ITU World Radiocommunication Conference (2019) (WRC-19) was held from 28 October to 22 November 2019 in Sharm el-Sheikh, Egypt. 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), an RO CNS, ICAO MID Office (third week), and three TOs/AOI from Headquarters, (two full time and one for the first two weeks).

1.3 In total, about 3 500 delegates from most of the 193 ITU Member States and 260 other entities, including international organizations and industry, participated in the work of the conference.

1.4 Five formal aviation coordination meetings were organized by the ICAO delegation during the conference and were attended by up to 40 people each. Coordination and promotion of the ICAO policy during the conference was also performed on a more 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 keeps growing, 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 so as 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 A38-6, 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-19

2.3.1 Development and distribution of the ICAO Position:

a) initially developed in 2016 by the Frequency Spectrum Management Panel (FSMP), reviewed by the Air Navigation Commission (203-4 and 205-3), approved by Council (211/8) on 19 June 2017 and sent to States (State letter E 3/5-17/82);

b) subsequent update by the FSMP to reflect the progress of studies within ITU and the FSMP, reviewed by the Commission (211-3), approved by Council (217/4) on 27 May 2019 and sent to States (State letter E 3/5-19/49); and

c) ICAO Position submitted to the ITU WRC-19 on 9 July 2019.

2.3.2 ICAO Secretariat preparatory activities (missions) to promote the ICAO Position and spectrum policy to secure adequate support in the preparatory work leading up to WRC-19:

a) support of ITU-Radiocommunication Sector (ITU-R) work activities, including ITU-R Study Groups 4 and 5, Working Parties 4A, 4C, 5B, CPM-19/2, RA-19; on average eleven man-weeks per year;

b) support of the WRC-19 preparatory activities of regional telecommunication organizations[1]; on average four man-weeks per year; and

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

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

3.1 WRC-19 Agenda Item 1.7: Spectrum needs for telemetry, tracking and command in the space operation service (SOS) for non-GSO satellites with short duration missions (non-GSO SD)

3.1.1 While not addressing aeronautical frequency bands, this item was highly relevant. The outcome of preparatory studies prior to the WRC had already indicated that some of the frequency ranges addressed had the potential to adversely affect aeronautical and meteorological services.

3.1.1.1 Portions of the frequency ranges 148-174 MHz and 400.15-420 MHz are utilized for aviation support of maritime search and rescue operations. Emergency position indicating radio beacons (EPIRBs) which operate at 406-406.1 MHz are monitored globally by satellite (COSPAS-SARSAT). ITU-R studies performed prior to the conference had already indicated that sharing between non-geostationary satellite orbit satellites with short duration missions (non-GSO SD) (both Earth-to-space and space-to-Earth; E-s and s-E) and the existing incumbent services in these frequency ranges is not feasible.

3.1.1.2 The conference focussed on existing SOS allocations in the frequency range 137-138 MHz for the satellite downlink (s-E). However, as a large number of non-GSO SD satellites are envisaged, these additional satellites would create a very large increase in traffic in this range, which is immediately adjacent to the aeronautical VHF communication band 117.975-137 MHz used to support safety critical aeronautical communications. In particular, as specified in the Standards and Recommended Practices (SARPs) of Annex 10 — *Aeronautical Telecommunications*, Volume III — *Communication Systems*), the frequency 136.975 MHz is the worldwide common signalling channel (CSC) for VHF digital link Mode 2 (VDLM2).

3.1.2 During the ITU-R preparatory studies, the proponents of the non-GSO SD systems could not agree to the aeronautical protection criteria identified by ICAO as being necessary to protect the VDLM2 system. Hence, this became one of the more controversial issues during the conference and a large effort had to be spent to ensure sufficient protection of the VDLM2 system.

3.1.3 The solution agreed by the conference includes a 25 kHz guard band and a resolution which requires that, as a minimum, the whole of the occupied bandwidth (99 per cent of the emitted energy) of the emissions by the non-GSO SD SOS stations, including Doppler shift and frequency tolerance, is maintained completely above 137 MHz.

3.1.4 While the above result fully satisfies the ICAO Position, it should be noted that the frequency range 137-138 MHz is already allocated to the mobile satellite service and the space operations service. It is also foreseen that, in the future, this band will see more use of such systems where its use will not only be limited to non-GSO SD systems addressed under this agenda item.

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

Consequently, efforts need to be undertaken by aviation stakeholders to ensure the continued safe operation of VDLM2.

3.2 WRC-19 Agenda Item 1.8: Possible regulatory actions to support the modernization of global maritime distress and safety systems (GMDSS)

3.2.1 Civil aviation shares certain systems with the marine industry for safety and distress; for instance in the case of a marine distress, in all likelihood there will be aircraft involved in its search and rescue operations. Under this item, the marine industry looked at improving the GMDSS by adding a satellite service to it. The same satellite service provider (Iridium) also operates an aeronautical mobile satellite (route) service (AMS(R)S) in portions of the affected frequency band (1616-1626.5 MHz). This service is used to provide aircraft position reporting and communications between air traffic controllers and aircraft pilots, particularly in remote, oceanic and polar areas.

3.2.2 The frequency band 1616-1626.5 MHz has very complex sharing conditions. The AMS(R)S is afforded priority in accordance with Article 40 of the ITU Constitution. In this frequency band, the AMS(R)S is operated in accordance with footnote 5.367 of the Radioregulations (RR; RR 5.367), which, when appropriately coordinated, provides the protection required commensurate to an aeronautical safety service. However, when the same satellite system is also used to *provide mobile satellite service (MSS) and maritime mobile satellite service (MMSS), then entirely different* conditions apply, including those afforded to a secondary service (no protection against harmful interference) in the satellite downlink direction.

3.2.3 Several of the proposed solutions considered by the conference would inadvertently have disconnected the safety of life protection afforded to the AMS(R)S by exacerbating an already existing inconsistency: provision RR 5.367 provided AMS(R)S in the frequency band, while provision RR 5.368 explicitly stated that the provisions of a safety service should not apply for the MSS (AMS(R)S can be considered to be a subset of the MSS). Through ICAO efforts during the final phase of WRC preparations (final meetings of CEPT, CITEL and APT) and during the conference itself, WRC-19 managed to develop a solution which completely removed the previously existing inconsistencies relating to the operation of AMS(R)S in the band, while providing the MMSS a primary allocation in both directions and providing the GMDSS provisions consistent with those of a safety service.

3.3 WRC-19 Agenda Item 1.10: Spectrum needs and regulatory provision for the introduction and use of the global aeronautical distress and safety system (GADSS)

3.3.1 The GADSS concept was developed in the wake of the Special Meeting on Global Flight Tracking of Aircraft in Montréal, May 2014, and endorsed by the ICAO Second High-level Safety Conference 2015 (HLSC 2015). The collective urgency of the situation identified by ICAO was also endorsed by the decision of the ITU Plenipotentiary Conference (October 2014) for ITU WRC-15 to facilitate, at an unusually short notice, the development of regulatory provisions to enable the tracking of aircraft using 1090 MHz Extended Squitter, Automatic Dependent Surveillance – Broadcast (1090ES ADS-B) in oceanic and remote airspaces. WRC-15 also agreed to a WRC-19 agenda item, to address any potential further spectrum needs and regulatory actions by WRC-19, for the introduction of GADSS.

3.3.2 Introduction of the GADSS is already taking place through a number of new SARPs, including the mandating of new requirements for aircraft operators to continuously track their aircraft under the various circumstances during a normal flight, as well as distress- and safety-tracking at a much higher rate if an unusual/unsafe circumstance occurs. Preparatory studies for WRC-19 within

ICAO concluded that as the GADSS is being introduced as a set of performance requirements for aircraft tracking, autonomous distress tracking and post flight localization and recovery, it is sufficient to identify those performance requirements in SARPs and, as such, there would not be a need for any amendments to the ITU Radioregulatory framework.

3.3.3 An approach was explored where GADSS could be introduced in a "soft" manner in the RR by mentioning, under the chapter on distress and safety communications, that regulatory provisions relating to the GADSS were to be found in SARPs. This approach was not found acceptable by a number of Administrations who insisted that detailed technical provisions and compatibility criteria for GADSS-related systems would then also need to be reflected in the ITU Regulatory Framework. The requirement to develop detailed technical provisions for GADSS within ITU in parallel with similar provisions being developed in ICAO was clearly not a good way forward; hence, this could not be supported.

3.3.4 The conference finally decided that no new regulatory provisions were required to facilitate the implementation of GADSS. This result fully satisfies the ICAO Position and does not impact the continued implementation of GADSS.

3.4 WRC-19 Agenda Item 9.1.4: Stations on-board sub-orbital vehicles

3.4.1 Sub-orbital vehicles, including space planes, are being 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. Studies have shown that, in principle from a technical perspective, current ICAO systems should have the capability to provide suitable radio links for sub-orbital vehicles to operate safely except in regions where communication blackout is experienced.

3.4.2 Based on the outcome of the initial studies performed under this agenda item, the conference agreed to a WRC-23 agenda item (WRC-23 AI 1.6), to consider regulatory provisions to facilitate the introduction of sub-orbital vehicles, in particular any potential new/modified definitions in the RR to accommodate such operations. Successful resolution of this item by WRC-23 could, for example, facilitate tracking of space launch vehicles by ADS-B, thus reducing any impact caused by space launches and by reducing the size of the restricted area of affected airspaces.

3.5 WRC-19: Other relevant agenda items

3.5.1 Other aviation relevant agenda items included: 1.9, 1.11, 1.12, 1.13, 1.14, 1.16, 4, 8, 9.1 (Issue 9.1.3) and 9.1 (Issue 9.1.6). The outcome of all of those items satisfied the ICAO Position. The full "Provisional Final Acts" of WRC-19 can be found at this link: https://www.itu.int/pub/R-ACT-WRC.13-2019/en.

4. AGENDA FOR WRC-23 (2023), AS AGREED BY WRC-19

4.1 It is already evident that the ITU-R studies during the WRC-23 study cycle will be more heavily loaded than during previous cycles. Not only are there more items in total for that conference than during previous cycles, more of those are also directly related to aviation. Aviation related agenda items include:

- 1.6: Sub-orbital vehicles (para 3.5 refers);

- 1.7: AMS(R)S allocation for aeronautical VHF. Successful resolution could, when implemented together with satellite-based ADS-B, facilitate implementation of radar-like separation/control in oceanic/remote airspaces;

- 1.8: FSS for Unmanned Aircraft Systems (ITU defines Unmanned Aircraft Systems in a manner consistent with the ICAO definition of Remotely Piloted Aircraft Systems, or RPAS). This item (see ITU Resolution 155) was originally developed by WRC-15. It has been very difficult to progress the study during the WRC-19 study cycle. Successful finalization by WRC-23 is essential to facilitate the implementation of beyond-line-of-sight C2-Link communications for RPAS; and

- 1.9: Review/update of Appendix 27 to the RR in support of aeronautical HF modernization. Modernized digital wideband HF systems can potentially provide datacommunications in remote and oceanic areas at a low cost, while providing high uptime and data rate, including the potential for digitally encoded (clear) air-ground voice communications.

4.2 In addition to the above, there are items which can provide benefit for aviation, such as potential new aeronautical spectrum for non-safety related services (see WRC-23 agenda items 1.4, 1.5, 1.10, 9.1.1).

4.3 A number of items have the potential to adversely impact existing aeronautical services such as Radio Altimeters and VSAT (see WRC-23 agenda items 1.1, 1.2, 1.3, 1.4, 1.11, 1.15, 1.16).

5. CONCLUSION

5.1 In general, the WRC-19 results fully conformed to the ICAO Position. 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 Commission, 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 (e.g. Study Groups 4 and 5, including the relevant Working Parties, and the Conference Preparatory Meeting (CPM));

c) the active participation by ICAO experts in the meetings of the 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 FSMP working group meetings and ICAO radio frequency workshops in the ICAO regions;

e) the implementation of Assembly Resolution A38-6; 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.

5.2 As a reminder of the fact that success is by no means guaranteed and that a lot of hard work is required, a declaration by the World Meteorological Organization (WMO) as entered into the minutes of WRC-19 should be noted: https://public.wmo.int/en/media/news/wmo-expresses-concern-about-radio-frequency-decision.

5.3 Radio frequency spectrum is a critical component of infrastructure that serves all aeronautical communications, navigation and surveillance services and is often protected as a safety-of-life function under the Radio Regulations. The mismanagement, non-availability or interference with relevant spectrum directly compromises the ability to communicate with, control, navigate and/or electronically surveil aircraft. The attendant reductions in safety performance include, as examples, loss of conflict resolution and separation functions by air traffic controllers; loss of navigation capabilities by pilots and inability to conduct reduced visibility landing; and the inability to relay weather information.

5.4 It is important that the Organization and its Member States take measures to ensure that aviation remains a sustainable user of the frequency spectrum. On this note, the 13th Air-Navigation Conference (AN-Conf/13) recommended to "*launch a study, built on a multi-disciplinary view of the C, N and S elements and frequency spectrum, to evolve the required CNS and frequency spectrum access strategy and systems roadmap in the short, medium and long term, in a performance based and service-oriented manner, to ensure that CNS systems remain efficient users of the spectrum resource"*. Work is being initiated to undertake this study. This activity is expected to benefit the development of aeronautical CNS systems and their spectrum use in the longer term and eventually the formulation of the ICAO spectrum policy for future WRCs.

5.5 In many States, the limited spectrum expertise in the often public-sector aviation agencies such as safety regulators is readily overpowered by the non-aviation spectrum expertise specifically engaged by private or public/private interests targeting existing aeronautical spectrum for non-aviation uses such as telecommunications.

5.6 The ICAO policies and practices related to radio frequency spectrum matters, as outlined in Assembly Resolution A38-6, should be noted, including the obligation by States and ICAO to fully support the ITU WRC process.

5.7 An expeditious start of the ICAO preparatory activities for the next conference in 2023 is now essential. The FSMP will develop an initial draft of the ICAO Position by the end of 2020, to be subsequently reviewed by the Air Navigation Commission and sent to States for comments. A final review of the ICAO Position and its subsequent approval by the Council is foreseen by mid-2021.

5.8 In light of the constantly growing demand for spectrum for non-aviation users (section 2.1 refers), it is expected that non-aviation interests will oppose some or all of the elements of the ICAO Position at WRC-23 by targeting existing aeronautical spectrum for allocation to other uses and by opposing aviation attempts to obtain new allocations. As a consequence, a very large effort will be required on the part of the Organization and its Member States to ensure that the ICAO Position is supported by the conference.

6. ACTION BY THE MEETING

6.1 The Meeting is invited to:

a) note the information contained in this paper; and

b) support ICAO Position in national, regional and global WRC-23 preparatory activities.

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