



## **ICAO International Civil Aviation Organisation**

### **ICAO POSITION FOR THE INTERNATIONAL TELECOMMUNICATION UNION (ITU) WORLD RADIOCOMMUNICATION CONFERENCE 2019 (WRC-19)**

#### **SUMMARY**

This paper reviews the agenda for the International Telecommunication Union (ITU) World Radiocommunication Conference 2019 (WRC-19), discusses points of aeronautical interest and provides the ICAO Position for these agenda items.

The ICAO Position aims at protecting aeronautical access to appropriately protected spectrum for radiocommunication and radionavigation systems that support current and future safety-of-flight applications. In particular, it stresses that safety considerations require that adequate protection against harmful interference must be ensured.

Support of the ICAO Position by Contracting States is required to ensure that the position is supported at the WRC-19 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-19

## 1. INTRODUCTION

1.1 The ICAO Position on issues of interest to international civil aviation to be addressed at the 2019 ITU World Radiocommunication Conference (WRC-19) 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* (Doc 9718, Second Edition, 2018). Doc 9718 is available on <http://www.icao.int/safety/fsmf> (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 WR-07, that the compatibility of ICAO standard systems with existing or planned aeronautical systems operating in accordance with international aeronautical Standards will be ensured by ICAO. 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 in hundreds of nations. Since the mid-1970s, air traffic growth has consistently defied economic recessionary cycles, expanding two-fold once every fifteen years. It is estimated that in 2018 air transport directly and indirectly supported the employment of 65.5 million people, contributing over U.S.\$ 2.7 trillion to the global gross domestic product (GDP), and carried over 4.3 billion passengers and over 60 million tonnes of cargo.

3.2 The safety of air operation 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 Strategy<sup>1</sup>, as addressed by the Twelfth Air Navigation Conference, and as approved by the ICAO Council.

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<sup>1</sup> 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* (Doc 9718).

3.3 In support of the safety aspects related to the use of radio frequency spectrum by aviation, **Article 4.10** of the Radio Regulations states, “*ITU 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.

3.4 The continuous increase in air traffic movements as well as the additional requirement for accommodating new and emerging applications such as unmanned aircraft systems (UAS<sup>2</sup>) is 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.

3.5 The ICAO Position for the ITU WRC-19 was initially developed in 2016 with the assistance of the Frequency Spectrum Management Panel (FSMP) and was reviewed by the Air Navigation Commission at the fourth meeting of its 203rd Session on 24 November 2016. 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 the light of the comments received by the Commission on 9 May 2017, the ICAO Position was reviewed and approved by the ICAO Council on 19 June 2017. Taking into account the results of studies within the ITU, the ICAO Position was updated and approved by the ICAO Council on 27 May 2019. This document contains that updated ICAO WRC-19 Position.

3.6 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-19 at the national level, in the activities of the regional telecommunication organizations<sup>3</sup> and in the relevant meetings of the ITU.

#### 4. AERONAUTICAL ASPECTS ON THE AGENDA FOR WRC-19

*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-19 Agenda Items 1.10 and 9.1 (Issue 9.1.4) address issues where aviation is seeking action by the WRC.*

*Note 3.— WRC-19 Agenda Items 1.7, 1.8, 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) 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-19 Agenda Items 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.15, 2, 3, 5, 6, 7, 9.1 (Issue 9.1.1), 9.1 (Issue 9.1.2), 9.1 (Issue 9.1.5), 9.2 and 9.3 which are therefore not addressed in this position.*

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<sup>2</sup> UAS is referred to in ICAO as remotely piloted aircraft systems (RPAS).

<sup>3</sup> 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).

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## WRC-19 Agenda Item 1.7

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### Agenda Item Title:

**To study the spectrum needs for telemetry, tracking and command in the space operation service for non-GSO satellites with short duration missions, to assess the suitability of existing allocations to the space operation service and, if necessary, to consider new allocations, in accordance with Resolution 659 (WRC-15).**

### Discussion:

The frequency 136.975 MHz is recognized by ICAO as the reserved worldwide common signaling channel (CSC) for VHF digital link Mode 2 (VDLM2). The CSC has already been implemented in many administrations and is essential to current and future digital air traffic control (ATC) networks in many regions.

Requirements have been identified for non-GSO satellites with short duration missions. Studies leading up to WRC-15 determined that those requirements would not necessitate new regulatory regimes, rather they could be addressed as part of the space operation service (SOS). WRC-19 studies will determine if existing SOS allocations are sufficient, and if not, will consider new allocations within the frequency ranges 150.05-174 MHz and 400.15-420 MHz.

ITU-R studies have proposed the possible use of existing SOS allocations in the frequency band 137-138 MHz for the satellite downlink (space-to-Earth; “s-E”) and the frequency band 148-149.9 MHz for the earth station [uplink] (Earth-to-space; “E-s”). As a result, the additional satellites utilizing the existing SOS allocation are likely to increase traffic in the 137-138 MHz frequency band. Given that the frequency band below 137 MHz is used to support aeronautical safety systems, all efforts should be made to fully protect existing aeronautical systems below 137 MHz and specifically VDLM2. In particular, as there is no allocation for SOS below 137 MHz, as a minimum the emissions of SOS stations should be in compliance with Recommendation ITU-R SM.1540, especially *recommends* 1, thus ensuring that the whole of the occupied bandwidth, including Doppler shift and frequency tolerance, is maintained completely within the allocated band.

Studies of the impact of a proposed removal of the existing RR No. **9.21** coordination requirement for the existing SOS allocation in the 148-149.9 MHz frequency band are also required to understand (a) if this proposal is within the scope of the agenda item, (b) if it affects negatively the compatibility between the terrestrial and space services sharing the band 148-149.9 MHz, and (c) how it changes the status of existing and planned networks coordinated under RR No. **9.21** in this band.

Regarding new allocations, portions of the frequency ranges 150.05-174 MHz and 400.15-420 MHz are utilized by aviation for systems operating in the fixed service, the land mobile service, for

aviation support of maritime search and rescue operations, and for emergency position indicating radio beacons (EPIRBs) which operate in the frequency band 406-406.1 MHz which is monitored globally by satellite (COSPAS-SARSAT). All ITU-R studies conducted in the frequency ranges 150.05-174 MHz and 406-420 MHz, which are the portions utilized by aviation systems, show that sharing between non-GSO SD systems (both E-s and s-E) and the existing incumbent services in these frequency ranges is not feasible.

In addition to concerns about the impact a change of use of existing and the potential introduction of new SOS frequency allocations on aeronautical systems, aviation is also currently considering proposals by various entities for the use of so called space planes<sup>4</sup> to either act as a relatively cheap re-useable satellite launch vehicle or to carry tourists who wish to experience space travel.

Such vehicles will need access to spectrum to both monitor the flight progress as well as interact with air traffic control for clearance through other traffic to both climb to the cruise altitude as well as to descend into the destination airport. Given that they intended to operate above the Karman line but sub-orbitally any spectrum requirement does not naturally fall under either terrestrial or satellite definitions and hence the spectrum need may well either totally or in part be met under a space operation service allocation. Therefore, ICAO would not want to see any action taken under this agenda item that would preclude the use of SOS allocations for space planes should this service be deemed appropriate for such use.

#### **ICAO Position:**

To oppose consideration of possible allocation to the space operation service in the frequency range 405.9-406.2 MHz unless agreed ITU-R studies have proven aviation use of the EPIRBs operating in the frequency band 406-406.1 MHz is protected in accordance with Resolution **205 (Rev. WRC-15)** and RR No. **5.267**.

To oppose any new allocations to the space operations service in other frequency bands/ranges that could impact aeronautical safety systems unless agreed ITU-R studies have proven sharing and compatibility with those systems.

To ensure that the outcome from this agenda item protects aeronautical safety systems below 137 MHz from harmful interference.

To ensure that any change to the regulatory provisions and spectrum allocations resulting from this agenda item do not preclude the use of any particular allocations for space planes if the radiocommunication service is deemed appropriate for such use.

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<sup>4</sup> A space plane is taken to be an aerospace vehicle that operates as an aircraft in Earth's atmosphere, as well as a spacecraft when in space.

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## WRC-19 Agenda Item 1.8

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### Agenda Item Title:

**To consider possible regulatory actions to support global maritime distress safety systems (GMDSS) modernization and to support the introduction of additional satellite systems into the GMDSS, in accordance with Resolution 359 (Rev. WRC-15).**

### Discussion:

Search and rescue aircraft and helicopters are an integral part of the global maritime distress and safety system, providing a rapid search capability that can effect 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 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)<sup>5</sup>. Therefore, if a system which already carries such communications were to be identified to also 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 to effectively communicate with vessels during disaster relief operations.

To ensure that any regulatory provisions in response to this agenda item do not adversely impact SARPs compliance of aeronautical mobile-satellite (route) service satellite systems.

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<sup>5</sup> Annex 10, Volume III, paragraph 4.4.1: "Every aircraft earth station and ground earth station shall be designed to ensure that messages transmitted in accordance with Annex 10, Volume II, 5.1.8, including their order of priority, are not delayed by the transmission and/or reception of other types of messages. If necessary, as a means to comply with the above requirement, message types not defined in Annex 10, Volume II, 5.1.8 shall be terminated even without warning, to allow Annex 10, Volume II, 5.1.8 type messages to be transmitted and received."

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## WRC-19 Agenda Item 1.9

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### Agenda Item Title:

To consider, based on the results of ITU-R studies:

**1.9.1 regulatory actions within the frequency band 156-162.05 MHz for autonomous maritime radio devices to protect the GMDSS and automatic identifications system (AIS), in accordance with Resolution 362 (WRC-15);**

**1.9.2 modifications of the Radio Regulations, including new spectrum allocations to the maritime mobile-satellite service (Earth-to-space and space-to-Earth), preferably within the frequency bands 156.0125-157.4375 MHz and 160.6125-162.0375 MHz of Appendix 18, to enable a new VHF data exchange system (VDES) satellite component, while ensuring that this component will not degrade the current terrestrial VDES components, applications specific messages (ASM) and AIS operations and not impose any additional constraints on existing services in these and adjacent frequency bands as stated in *recognizing d) and e) of Resolution 360 (Rev. WRC-15).***

### Discussion:

Search and rescue aircraft and helicopters are an integral part of the global maritime distress and safety system, providing a rapid search capability that can effect 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 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

### ICAO Position:

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

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## WRC-19 Agenda Item 1.10

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### Agenda Item Title:

**To consider spectrum needs and regulatory provisions for the introduction and use of the global aeronautical distress and safety system (GADSS), in accordance with Resolution 426 (WRC-15).**

### Discussion:

ICAO, upon the completion of a Special Meeting on Global Flight Tracking of Aircraft in Montréal, May 2014, forged consensus among its Member States and the international air transport industry sector that tracking of flights anywhere in the world was a near-term priority. The meeting concluded that global flight tracking should be pursued as a matter of urgency and, as a result, two groups were formed, an ICAO Ad hoc Working Group on Aircraft Tracking which developed a concept of operations to support future development of a global aeronautical distress and safety system (GADSS), and an industry-led group within the ICAO framework called the Aircraft Tracking Task Force (ATTF) that identified near-term capabilities for normal flight tracking using existing technologies. In combination, those efforts will address issues such as:

- a) aircraft tracking under normal and abnormal conditions;
- b) autonomous distress tracking;
- c) flight data recovery; and
- d) GADSS procedures and information management.

The GADSS concept describes a process that will build on the identified near-term capabilities in an evolutionary manner. While the systems needed to support such an evolution have yet to be fully defined, it is anticipated that there may be a need to change a number of Radio Regulations provisions, for example some of those contained in Chapter VII *Distress and Safety Communications* (Articles 30 to 34) and Chapter VIII *Aeronautical Services* (Articles 35 to 45), in order to facilitate the introduction of such a system. The agenda item established for WRC-19 is flexible enough to address any requirement for such changes.

ICAO supported studies as called for as part of Resolution **426 (WRC-15)** and identified the additional/modified regulatory provisions required to provide suitable recognition of, and support for, GADSS.

Additional information on the development of the ICAO Global Tracking Initiatives can be found at: <http://www.icao.int/safety/globaltracking/Pages/GADSS-Update.aspx>.



**ICAO Position:**

To support action by WRC-19 to integrate those changes into the Radio Regulations that:

- introduce GADSS as performance requirements for the radiocommunication systems used for aircraft tracking, autonomous distress tracking and post flight localization and recovery;
- identify that relevant GADSS elements are defined in ICAO SARPs;
- preclude use of GADSS systems operating under No. **4.4**.

To oppose changes to the Radio Regulations that:

- identify specific GADSS elements or operating frequency bands.

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## WRC-19 Agenda Item 1.11

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### Agenda Item Title:

**To take necessary actions, as appropriate, to facilitate global or regional harmonized frequency bands to support railway radiocommunication systems between train and trackside within existing mobile service allocations, in accordance with Resolution 236 (WRC-15).**

### Discussion:

Railway transportation systems are evolving, integrating different technologies in order to facilitate various functions. These can include, for instance, sending commands, operating control and data transmissions between train and trackside systems to meet the needs of a high-speed railway environment. Those functions may not be supported by the current narrowband railway radiocommunication systems so infrastructure investment will be required. As a result, this agenda item looks for studies leading to global or regional harmonized frequency bands, to the extent possible, for the implementation of railway radiocommunication systems between train and trackside within existing mobile-service allocations.

According to the current ITU-R documents existing railway radiocommunication systems between train and trackside (RSTT) operate in portions of several frequency ranges, including 140-150 MHz, 330-360 MHz, 410-420 MHz and 450-460 MHz, however this list of the bands may be not exhaustive. Taking into account that the band 328.6-335.4 MHz is allocated to the aeronautical radionavigation service on a primary basis limited to ILS glide path and since the aeronautical mobile service is a subset of the mobile service, aviation should monitor this agenda item to ensure protection of aeronautical systems/frequency bands.

### ICAO Position:

To ensure, on the basis of agreed ITU-R studies, that any regulatory actions within existing mobile-service bands do not impact existing aeronautical systems operating in accordance with the Radio Regulations.

Ensure that no frequency bands specifically allocated to aeronautical mobile services, including aeronautical mobile (R) and (OR) services, are referenced as suitable for the provision of train to trackside communication.

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## WRC-19 Agenda Item 1.12

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### Agenda Item Title:

**To consider possible global or regional harmonized frequency bands, to the maximum extent possible, for the implementation of evolving intelligent transport systems (ITS) under existing mobile-service allocations, in accordance with Resolution 237 (WRC-15).**

### Discussion:

Information and communication technologies can be integrated in a vehicle system to provide intelligent transport systems (ITS) communication applications for the purpose of improving traffic management and assisting safe driving. Future vehicular radiocommunication technologies and ITS broadcast systems are emerging and, while some administrations have harmonized frequency bands for ITS radiocommunication applications, others do not. Recognizing that harmonized spectrum and International Standards would facilitate worldwide deployment of ITS radiocommunications and provide for economies of scale in bringing ITS equipment and services to the public, ITU-R studies will consider possible global or regional harmonized frequency bands for the implementation of evolving ITS under existing mobile-service allocations.

The mobile service frequency bands that are currently being studied or used for ITS communications applications include 5 725-5 875 MHz (dedicated short range communications) and 57-66 GHz (integrated systems for ITS). The frequency range 76-81 GHz is also being studied for ITS, however it is for vehicular collision avoidance radars.

Since the aeronautical mobile service is a subset of the mobile service, aviation should monitor this agenda item to ensure protection of aeronautical systems/frequency bands.

### ICAO Position:

To ensure, on the basis of agreed ITU-R studies, that any regulatory actions within existing mobile-service bands do not impact existing aeronautical systems operating in accordance with the Radio Regulations.

Ensure that no frequency bands specifically allocated to aeronautical mobile services, including aeronautical mobile (R) and (OR) services, are referenced as suitable for the provision of ITS communications.

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## WRC-19 Agenda Item 1.13

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### Agenda Item Title:

**To consider identification of frequency bands for the future development of international mobile telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution 238 (WRC-15).**

### Discussion:

Resolution **238 (WRC-15)** identifies a number of frequency bands/ranges between 24.25 and 86 GHz that can be considered under this agenda item to be identified for the terrestrial component of international mobile telecommunication use, namely:

- 24.25-27.5 GHz, 37-40.5 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz, 66-76 GHz and 81-86 GHz, which have allocations to the mobile service on a primary basis; and
- 31.8-33.4 GHz, 40.5-42.5 GHz and 47-47.2 GHz, which may require additional allocations to the mobile service on a primary basis.

The frequency band 24.25-24.65 GHz is used for airport surface detection equipment (ASDE) in some countries. Additionally, the frequency range 31.8-33.4 GHz is identified in the “*Handbook on Radio Frequency Spectrum Requirements for Civil Aviation*”<sup>6</sup> as also being used for ASDE. The higher frequency ranges give greater resolution; a factor that is gaining greater importance with the ever increasing density of traffic at airports.

The 31.8-33.4 GHz frequency range is also used for embedded systems that generate navigation information and a video image of the external scene and provide them to the pilot. The band offers a good compromise between resolution and atmosphere penetration in bad weather conditions.

The frequency range 76-81 GHz is allocated to the radiolocation service on a primary basis in all three ITU regions and is planned to be used for non-safety-critical, advisory applications on the airport surface such as wing-tip radar. According to Resolution **238 (WRC-15)** the frequency range 76-81 GHz is excluded from consideration for IMT, however, any new identification for the terrestrial component of IMT should ensure adjacent band protection of these aviation applications.

Finally, the frequency bands 43.5-47 GHz and 66-71 GHz have allocations to the radionavigation and/or radionavigation-satellite services. However no aeronautical systems have currently been identified as operating in those frequency bands.

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<sup>6</sup> Doc 9718, Volume I, Second Edition, 2018.

**ICAO Position:**

To oppose any identification of a frequency band for IMT that could impact aviation systems, including enhanced flight vision systems (EFVS) operating in the 31.8-33.4 GHz frequency band, within a new or existing allocation to the mobile service in the frequency range 24.25 to 86 GHz, unless agreed ITU-R studies demonstrate no adverse impact to those systems.

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## WRC-19 Agenda Item 1.14

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### Agenda Item Title:

**To consider, on the basis of ITU-R studies in accordance with Resolution 160 (WRC-15), appropriate regulatory actions for high-altitude platform stations (HAPS), within existing fixed-service allocations.**

### Discussion:

High altitude platform stations (HAPS) are defined in No. **1.66A** of the Radio Regulations as stations located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth. Under this agenda item, the following studies will be conducted:

- a) To review the current RR identifications for HAPS in the bands 6 440-6 520 MHz, 6 560-6 640 MHz, 27.9-28.2 GHz, 31.0-31.3 GHz, 47.2-47.5 GHz and 47.9-48.2 GHz and the related WRC Resolutions with a view to possibly modifying the geographical limitations and conditions of operation of HAPS in these bands;
- b) In order to meet any spectrum needs that could not be satisfied in the frequency bands indicated in bullet a) above, to study the following bands already allocated to the fixed service on a primary basis for possible identification for HAPS:
  1. on a global level: 38-39.5 GHz; and
  2. on a regional level: in Region 2, 21.4-22 GHz and 24.25-27.5 GHz.

HAPS are designed to deliver various communication services over a wide area without the need for ground infrastructure. For example, administrations that currently use VSATs for the provision of aeronautical communication due to the lack of ground infrastructure may be able to use HAPS as an alternative, possibly cheaper, means of providing that infrastructure. Additionally in the future aviation may wish to incorporate the use of platforms such as HAPS into the global air ground communication network. It is therefore important to ensure that any action taken under this agenda item does not adversely affect the potential use of HAPS for aeronautical purposes in the future.

An additional concern is regarding the platform on which the HAPS resides. Care must be taken that radio links used for the HAPS communications service function do not impact any radio links used for safe operation (e.g. command and control links or detect-and-avoid) of those platforms.

**ICAO Position:**

If agreed ITU-R studies demonstrate there is no adverse impact on aeronautical systems including those used for the safe operation of the platform on which the HAPS resides, then support the use of fixed service allocations for HAPS provided that any regulatory actions taken within the existing allocations to the fixed service noted in Resolution **160 (WRC-15)** do not constrain any potential future aeronautical use of those high-altitude platforms or fixed links.

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## WRC-19 Agenda Item 1.16

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### Agenda Item Title:

**To consider issues related to wireless access systems, including radio local area networks (WAS/RLAN), in the frequency bands between 5 150 MHz and 5 925 MHz, and take the appropriate regulatory actions, including additional spectrum allocations to the mobile service, in accordance with Resolution 239 (WRC-15).**

### Discussion:

This agenda item seeks to identify additional spectrum to facilitate the development of wireless access systems, including radio local area networks (WAS/RLAN) in the frequency bands between 5 150 MHz and 5 925 MHz. A number of aviation systems used for the assurance of safety of flight operate in the three frequency bands identified below. It is essential to ensure that any new allocation to the mobile service, or changes to existing regulations, does not adversely impact the operation of these systems.

#### 5 150-5 250 MHz

The use of WAS/RLAN in this band is currently limited to indoor systems and in accordance with Resolution 229 (Rev. WRC-12). As a result of ITU-R studies, there are proposals to permit outdoor use in this frequency band provided appropriate mitigations are put in place that maintain the current interference environment. From an aviation perspective, the frequency band 5 150-5 250 MHz is also allocated worldwide on a primary basis to the aeronautical radionavigation service (ARNS), the fixed-satellite service (RR No. 5.447A), and in some countries of Region 1 as well as Brazil the aeronautical mobile service for aeronautical telemetry (RR No. 5.446C). The frequency band is catalogued in Report ITU-R M.2204 as available for possible use by UAS sense and avoid collision awareness ARNS systems that are designed to operate independently of aircraft collision avoidance systems (ACAS) and are considered to be an autonomous operational safety element for avoidance of other air traffic in the vicinity.

The frequency band immediately below 5 150 MHz is allocated to the aeronautical radionavigation service, the aeronautical mobile satellite (R) service and the aeronautical mobile service which is limited to aeronautical telemetry and to the aeronautical mobile (R) service. The latter is intended for broadband airport surface communications (i.e. AeroMACS).

#### 5 350-5 470 MHz

The frequency range 5 350-5 470 MHz is allocated worldwide on a primary basis to the ARNS and used on some aircraft for airborne weather radar. The airborne weather radar is a safety critical



instrument assisting pilots in deviating from potential hazardous weather conditions and detecting wind shear and microbursts. Previous studies performed by ITU-R indicated that sharing in the frequency bands 5 350 to 5 470 MHz between WAS/RLAN and certain airborne weather radar types, was not feasible if existing WAS/RLAN mitigation measures limited to the regulatory provisions of Resolution **229 (Rev. WRC-12)** were used. Sharing may only be feasible if additional WAS/RLAN mitigation measures are developed, studied and implemented. In addition, the autonomous UAS detect and avoid system described for the 5 150-5 250 MHz band above, is also being designed to be capable of operating in this frequency band.

The studies associated with this WRC-19 agenda item have shown that there are no feasible mitigation techniques that would ensure compatibility between incumbent and WAS/RLAN systems and hence the only method identified is no change to the Radio Regulations.

### **5 850-5 925 MHz**

The studies in this band focused on accommodating WAS/RLAN use under the existing primary mobile service allocation in frequency band 5 850-5 925 MHz.

**Aeronautical Mobile Telemetry:** RR No. **5.457C** allows some countries in Region 2 to use the band 5 925-6 700 MHz for aeronautical mobile telemetry for flight testing, however the footnote notes that “any such use does not preclude the use of this band by other mobile service applications or by other services to which this band is allocated on a co-primary basis and does not establish priority in the Radio Regulations”. It should be noted that there is a primary mobile allocation in all three regions in the 5 850-5 925 MHz band.

**Fixed satellite service (FSS) systems used for aeronautical purposes:** The frequency range 5 850-5 925 MHz is used by aeronautical VSAT networks for transmission (E-s) of critical aeronautical and meteorological information.

The studies associated with this WRC-19 agenda item have shown that there are no feasible mitigation techniques that would ensure compatibility between incumbent and WAS/RLAN systems and hence the only method identified is no change to the Radio Regulations.

### **ICAO Position:**

To ensure, on the basis of agreed ITU-R studies, that any new provisions, or changes to existing regulatory provisions, in the frequency bands/ranges 5 150-5 250 MHz, 5 350-5 470 MHz and 5 850-5 925 MHz do not adversely impact aviation systems. In particular, if transmitted e.i.r.p. levels are increased, ensure that unwanted emissions into frequency bands used by aviation are maintained at current levels or reduced.

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## WRC-19 Agenda Item 4

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**Agenda Item Title:**

**In accordance with Resolution 95 (Rev. WRC-07) to review the resolutions and recommendations of previous conferences with a view to their possible revision, replacement or abrogation.**

**ICAO Position:**

**Resolutions:**

<i>Resolution No.</i>	<i>Title</i>	<i>Action recommended</i>
<b>18 (Rev. WRC-15)</b>	Relating to the procedure for identifying and announcing the position of ships and aircraft of States not parties to an armed conflict.	No change
<b>20 (Rev. WRC-03)</b>	Technical cooperation with developing countries in the field of aeronautical telecommunications.	No change
<b>26 (Rev. WRC-07)</b>	Footnotes to the Table of Frequency Allocations in Article 5 of the Radio Regulations.	No change
<b>27 (Rev. WRC-12)</b>	Use of incorporation by reference in the Radio Regulations.	No change
<b>28 (Rev. WRC-15)</b>	Revision of references to the text of ITU-R recommendations incorporated by reference in the Radio Regulations.	No change
<b>63 (Rev. WRC-12)</b>	Protection of radiocommunication services against interference caused by radiation from industrial, scientific and medical (ISM) equipment.	No change
<b>76 (WRC-00)</b>	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

<i>Resolution No.</i>	<i>Title</i>	<i>Action recommended</i>
<b>95 (Rev. WRC-07)</b>	General review of the resolutions and recommendations of world administrative radio conferences and world radiocommunication conferences.	No change
<b>114 (Rev. WRC-15)</b>	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
<b>140 (Rev. WRC-15)</b>	Measures and studies associated with the equivalent power flux-density (epfd) limits in the band 19.7-20.2 GHz.	No change
<b>154 (WRC-15)</b>	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
<b>155 (WRC-15)</b>	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 <b>30</b> , <b>30A</b> and <b>30B</b> for the control and non-payload communications of unmanned aircraft systems in non-segregated airspaces.	Modify as necessary based on the results of on-going/-completed studies.
<b>157 (WRC-15)</b>	Study of technical and operational issues and regulatory provisions for new non-geostationary satellite orbit systems in the 3 700-4 200 MHz, 4 500-4 800 MHz, 5 925-6 425 MHz and 6 725-7 025 MHz frequency bands allocated to the fixed-satellite service.	Modify as necessary based on the results of studies under WRC-19 Agenda Item <b>9.1</b> , Issue <b>9.1.3</b> .

<i>Resolution No.</i>	<i>Title</i>	<i>Action recommended</i>
<b>160 (WRC-15)</b>	Facilitating access to broadband applications delivered by high-altitude platform stations.	Modify or suppress as necessary based on the results of studies carried out under WRC-19 Agenda Item <b>1.14</b> .
<b>205 (Rev. WRC-15)</b>	Protection of the systems operating in the mobile satellite service in the band 406-406.1 MHz.	No change
<b>207 (Rev. WRC-15)</b>	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
<b>217 (WRC-97)</b>	Implementation of wind profiler radars.	No change
<b>222 (Rev. WRC-12)</b>	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
<b>225 (Rev. WRC-12)</b>	Use of additional frequency bands for the satellite component of IMT.	No change
<b>239 (WRC-15)</b>	Studies concerning wireless access systems including radio local area networks in the frequency bands between 5 150 MHz and 5 925 MHz.	Modify or suppress as necessary based on the results of studies carried out under WRC-19 Agenda Item <b>1.16</b> .
<b>339 (Rev. WRC-07)</b>	Coordination of NAVTEX services.	No change
<b>354 (WRC-07)</b>	Distress and safety radiotelephony procedures for 2 182 kHz.	No change
<b>356 (WRC-07)</b>	ITU maritime service information registration.	No change
<b>360 (WRC-15)</b>	Consideration of regulatory provisions and spectrum allocations for enhanced automatic identification system technology applications and for enhanced maritime radiocommunication.	Modify as necessary based on the results of studies carried out under WRC-19 Agenda Item <b>1.9.1</b> .

<i>Resolution No.</i>	<i>Title</i>	<i>Action recommended</i>
<b>361 (WRC-15)</b>	Consideration of regulatory provisions for modernization of the global maritime distress and safety system and related to the implementation of e-navigation.	No change
<b>405</b>	Relating to the use of frequencies of the aeronautical mobile (R) service.	No change
<b>413 (Rev. WRC-12)</b>	Use of the band 108-117.975 MHz by aeronautical service.	No change
<b>417 (Rev. WRC-12)</b>	Use of the frequency band 960-1 164 MHz by the aeronautical mobile (R) service.	No change
<b>418 (Rev. WRC-15)</b>	Use of the band 5 091-5 250 MHz by the aeronautical mobile service for telemetry applications.	No change
<b>422 (WRC-12)</b>	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 <b>ITU-R M.2091</b> .
<b>424 (WRC-15)</b>	Use of wireless avionics intra-communications in the frequency band 4 200-4 400 MHz.	No change

<i>Resolution No.</i>	<i>Title</i>	<i>Action recommended</i>
<b>425 (WRC-15)</b>	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.	<p>Modify as follows:</p> <p><del>invites the ITU Radiocommunication Sector to complete, as a matter of urgency, the studies related to the space station reception of ADS-B in the frequency band 1 087.7-1 092.3 MHz.</del></p> <p><i>Further invites the International Civil Aviation Organization to continue to participate in the studies,</i></p> <p><i>instructs the Secretary-General</i></p> <p>to bring this Resolution to the attention of ICAO <del>and communicate the results of the studies when available.</del></p>
<b>426 (WRC-15)</b>	Studies on spectrum needs and regulatory provisions for the introduction and use of the global aeronautical distress and safety system.	Modify or suppress as necessary based on the results of studies carried out under WRC-19 Agenda Item <b>1.10</b> .
<b>608 (Rev. WRC-15)</b>	Use of the frequency band 1 215-1 300 MHz by systems of the radionavigation satellite service.	Modify as necessary to reflect the results of completed studies.

<i>Resolution No.</i>	<i>Title</i>	<i>Action recommended</i>
<b>609 (Rev. WRC-07)</b>	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
<b>610 (WRC-03)</b>	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
<b>612 (Rev. WRC-12)</b>	Use of the radiolocation service between 3 and 50 MHz to support oceanographic radar operations.	No change
<b>659 (WRC-15)</b>	Studies to accommodate requirements in the space operation service for non-geostationary satellites with short missions.	Modify or suppress as necessary based on the results of studies carried out under WRC-19 Agenda Item <b>1.7</b> .
<b>705 (Rev. WRC-15)</b>	Mutual protection of radio services operating in the band 70-130 kHz.	No change
<b>729 (Rev. WRC-07)</b>	Use of frequency adaptive systems in the MF and HF bands.	No change
<b>748 (Rev. WRC-15)</b>	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
<b>762 (WRC-15)</b>	Application of power flux density criteria to assess the potential for harmful interference under 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
<b>763 (WRC-15)</b>	Stations on board sub-orbital vehicles.	Modify to reflect the results of studies under WRC-19 Agenda Item <b>9.1</b> Issue <b>9.1.4</b> .

**Recommendations:**

<b><i>Recommendation No.</i></b>	<b>Title</b>	<b><i>Action recommended</i></b>
<b>7 (Rev. WRC-97)</b>	Adoption of standard forms for ship station and ship earth station licences and aircraft station and aircraft earth station licences.	No change
<b>9</b>	Relating to the measures to be taken to prevent the operation of broadcasting stations on board ships or aircraft outside national territories.	No change
<b>71</b>	Relating to the standardization of the technical and operational characteristics of radio equipment.	No change
<b>75 (Rev. WRC-15)</b>	Study on the boundary between the out-of-band and spurious domains of primary radars using magnetrons.	No change
<b>401</b>	Relating to the efficient use of aeronautical mobile (R) worldwide frequencies.	No change
<b>608 (Rev. WRC-07)</b>	Guidelines for consultation meetings established in Resolution <b>609 (WRC-03)</b> .	No change



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## WRC-19 Agenda Item 8

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### Agenda Item Title:

**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-07).**

### 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 deleted for safety and efficiency 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, 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 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. As a result, access to these bands by the mobile service is not feasible, in particular since no acceptable sharing criteria that secure the protection of aeronautical systems have been established to date. Nos. **5.181**,

**5.197** and **5.259** should now be deleted since they do not represent a realistic expectation for an introduction of the mobile service in these bands.

b) 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, those allocations should be deleted.

c) In the frequency band 1 215-1 300 MHz, which is used by civil aviation for the provision of radionavigation services through No. **5.331**. 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 urge administrations to remove their name from the No. **5.330**.

d) 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, 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 No **5.355** country footnote. ICAO would therefore urge administrations to remove their name from the No. **5.355**.

e) 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, 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 No. **5.359** country footnote. ICAO would therefore urge administrations to remove their name from the No. **5.359**.

f) In the frequency band 4 200-4 400 MHz, which is reserved for use by airborne radio altimeters and wireless avionics intra-communications (WAIC), 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. Deletion of this footnote is recommended.

**ICAO Position:**

To support deletion of 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 not feasible 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 operating in the frequency band 108-112 MHz.

To support deletion of 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 aeronautical safety communications.

To support deletion of 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 support deletion of 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 jeopardize aeronautical use of these frequency bands.

To support deletion of 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 support the deletion of 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.

*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. 5.197 Syrian Arab Republic*

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

*No. 5.202 Saudi Arabia, Armenia, Azerbaijan, Belarus, Bulgaria, the United Arab Emirates, the Russian Federation, Georgia, Iran (Islamic Republic of), Jordan, Moldova, Oman, Uzbekistan, Poland, the Syrian Arab Republic, Kyrgyzstan, Romania, 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. 5.359 Germany, Saudi Arabia, Armenia, Austria, Azerbaijan, Belarus, Benin, Cameroon, the Russian Federation, France, Georgia, Greece, 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, Tanzania, Tunisia, Turkmenistan and Ukraine*

*No. 5.439 Iran (Islamic Republic of)*

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## WRC-19 Agenda Item 9.1

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### Agenda Item Title:

**To consider and approve the report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the Convention:**

**On the activities of the Radiocommunication Sector since WRC-15.**

*Note.— The subdivision of Agenda Item 9.1 into issues, such as 9.1.1, 9.1.2, etc. was made at the first session of the Conference Preparatory Meeting for WRC-19 (CPM19-1) and is summarized in the BR Administrative Circular CA/226, 23rd December 2015.*

### Issue 9.1.3:

**Resolution 157 (WRC-15) – Study of technical and operational issues and regulatory provisions for non-geostationary-satellite orbit systems in the 3 700 – 4 200 MHz, 4 500 – 4 800 MHz, 5 925 –6 425 MHz and 6 725 – 7 025 MHz frequency bands allocated to the fixed-satellite service.**

### Discussion:

The frequency bands 3 700-4 200 MHz and 5 925-6 425 MHz are the main bands for VSAT transmissions used for aeronautical ground-ground communications, and parts are also used for feeder links for aviation satellite communications. In addition, the 3 700-4 200 MHz frequency band is adjacent to, and the 4 500-4 800 MHz band is near to, the frequency band 4 200-4 400 MHz in which radio altimeters and wireless avionics intra-communication (WAIC) systems operate. These systems are critical elements supporting safe operation of the aircraft in all phases of flight including navigation, automated landing and safety communications between points on the airframe. Recent study work in the ITU and ICAO, based on information provided by the manufacturers, has shown in theory that radio altimeters can be susceptible to possible interference from systems operating in nearby frequency bands. It is therefore essential to ensure, through sharing studies, that any new system allowed to operate in an adjacent or nearby frequency band will not exceed the interference criteria laid down in Recommendation **ITU-R M.2059** “Operational and technical characteristics and protection criteria of radio altimeters utilizing the band 4 200-4 400 MHz.”

**ICAO Position:**

To oppose any new or changes to existing regulatory provisions in Article 21 of the ITU Radio Regulations for the frequency bands 3 700-4 200 MHz and 5 925-6 425 MHz unless it has been demonstrated through agreed ITU-R studies that there will be no impact from the potential introduction of new non-geostationary-satellites on aviation use in those bands.

To oppose introduction of new non-geostationary-satellites in frequency bands near to the frequency band 4 200-4 400 MHz unless aviation use of that band is ensured through agreed ITU-R studies.

**Issue 9.1.4:**

**Resolution 763 (WRC-15) – Stations on board sub-orbital vehicles**

**Discussion:**

Sub-orbital vehicles, including space planes, 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. However, with the advances in technology, re-useable space vehicles that routinely take off and land on a traditional runway are close to becoming a reality with a number of companies actually testing vehicles. These vehicles perform various missions, such as deploying a space vehicle, conducting scientific research, carrying passengers and cargo, and then return to Earth's surface. It is expected that such vehicles will provide hypersonic travel that could cut the time taken to travel from Europe to Australia from approximately 24 hours to 90 minutes.

The introduction of such vehicles will bring a number of challenges to the spectrum and frequency management communities. Sub-orbital vehicles must safely share airspace used by conventional aircraft during certain phases of flight. There is a need to track and communicate with the sub-orbital vehicle for the entire duration of the flight to integrate those operations with all other airspace users. With respect to spectrum for systems and applications related to aviation safety, ICAO standardized systems are necessary for harmonization and interoperability with air traffic management (ATM) systems. However, since sub-orbital vehicles are intended to reach space and hence do not always perform as aircraft, stations on board that are standardized by ICAO for terrestrial use may not necessarily be consistent with the definitions in the Radio Regulations when used in space. Therefore 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, 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. However, from a terrestrial frequency planning perspective the additional height and velocity of sub-orbital vehicles would require current planning criteria to be amended with an associated adverse impact on system capacity which is unlikely to be acceptable and hence additional spectral capacity is likely to be required.

Additional regulatory and technical analysis is required to address the questions and concerns raised in the studies called for by Resolution **763 (WRC-15)**.

**ICAO Position:**

Based on the issues raised by the studies called for by Resolution **763 (WRC-15)**, support proposals for an agenda item for a future conference to resolve the regulatory and technical questions and concerns, including as necessary any new allocations.

**Issue 9.1.6:**

**Resolution 958 (WRC-15) – Urgent studies required in preparation for the 2019 World Radiocommunication Conference – Wireless power transmission (WPT) for electric vehicles**

**Discussion:**

Some preliminary work has been conducted by ITU-R Study Group 1 on wireless power transfer (WPT) and, in particular, the study of the feasibility of WPT in the low and very low frequency ranges (79-90 kHz) with power limits of up to 22 kW for charging electric vehicles. Most work, however, has been conducted by external standards organizations. It is important to note that the new technology has a much broader bandwidth with more complex modulation mechanisms, potentially leaking large amounts of power outside the existing bands being proposed for WPT. As a result, Issue **9.1.6** will need to be monitored to ensure harmonics do not impact aviation systems in nearby frequency bands, such as the non-directional beacons in 130-535 kHz, LORAN in 90-110 kHz, or aeronautical HF communications systems operating in select bands between 2 850- 22 000 kHz.

**ICAO Position:**

To ensure that the protection of aeronautical systems is appropriately taken into account during the studies called for in response to Resolution **958 (WRC-15)**.

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## WRC-19 Agenda Item 10

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### Agenda Item Title:

**To recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, in accordance with Article 7 of the Convention.**

### Discussion:

#### **UPDATES TO ITU RADIO REGULATIONS TO REFLECT BOTH CURRENT AND FUTURE AERONAUTICAL HF REQUIREMENTS**

The aeronautical use of the various HF AM(R)S frequency bands in the range 2 850-22 000 kHz is essential to long-distance aeronautical communications in remote and oceanic areas. Since the last substantive review of Appendix 27 of the ITU Radio Regulations in 1982, use of HF by aviation has continued to change and grow, especially for HF datalink (HFDL) services used by many aircraft.

Aviation is also considering future developments within the band, using new technology to significantly improve capacity, connectivity, and quality of service for aviation data and voice, including increased channel bandwidths for greater data throughput. Such developments within existing AM(R)S allocations would provide aviation with additional capabilities, improving global coverage and link diversity to L-band SATCOM systems to better maintain communications at all times.

In light of the evolving HF technologies, Appendix 27 needs to be reviewed to ensure it meets the current and future aeronautical requirements. ICAO would support any proposal for a WRC-23 Agenda Item to review and update Appendix 27.

### ICAO Position:

To support the inclusion of an item on the WRC-23 agenda to review and update Appendix 27 of the ITU Radio Regulations to ensure it meets current and future use of aeronautical HF communications and evolving technologies in the existing exclusive aeronautical mobile (R) service (AM(R)S) frequency bands between 2 850-22 000 kHz.



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## WRC-19 Agenda Item 10

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### Agenda Item Title:

**To recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, in accordance with Article 7 of the Convention.**

### Discussion:

#### **SPACE-BASED VERY HIGH FREQUENCY (VHF) VOICE SERVICES**

Space-based VHF voice service will enable direct controller-pilot communication (DCPC) in airspace where it is geographically remote or cost-prohibitive to provide and maintain terrestrial VHF voice services. When used in combination with air traffic service surveillance systems, the technology can be used to support radar-like separation minima and has the potential to improve airspace capacity and efficiency, particularly for remote and oceanic airspace. The technology can also be helpful as contingency communication infrastructure for airspace impacted by natural disasters, such as flooding and earthquakes.

The ICAO Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) meeting held in September 2018 supported the operating concept for space-based VHF voice services under Conclusion APANPIRG29/18. Furthermore, the APT Conference Preparatory Group for WRC-19 (APG19-4) held in Busan, South Korea from 7 to 12 January 2019, highlighted the concept of space-based VHF voice communications which would require study in the ITU-R, and therefore seeking consideration of a future Conference Agenda Item under WRC-19 Agenda Item 10.

The frequency band 108 MHz-137 MHz is allocated for aeronautical mobile (R) service (AM(R)S). For VHF transceivers to both transmit and receive aeronautical safety communications on board satellites, an AMS(R)S allocation will be required in some or all of the frequency band.

### ICAO Position:

To support a WRC-23 Agenda Item to seek an aeronautical mobile satellite (Route) service allocation for both the uplink and downlink of aeronautical VHF applications, while preventing any undue constraints based on the results of studies with existing VHF systems operating in the aeronautical mobile (R) and aeronautical radionavigation services.

— END —