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(NACC/WG/4)**

Ottawa, Canada, 24 to 28 March 2014

- Agenda Item 3: Follow-up on the NAM/CAR Regional Performance-Based Air Navigation Implementation Plan (NAM/CAR RPBANIP) Progress**
3.2 NAM/CAR Regional Performance-Based Air Navigation Implementation Plan: update, review and progress

THE ICAO POSITION FOR THE INTERNATIONAL TELECOMMUNICATION UNION (ITU) WORLD RADIOCOMMUNICATION CONFERENCE (2015) (WRC-15) AND UPDATES ON FREQUENCY ALIGNMENT LISTS

(Presented by the Secretariat)

EXECUTIVE SUMMARY	
<p>This working paper briefs on the current ICAO Position for the International Telecommunication Union (ITU) World Radiocommunication Conference (2015) (WRC-15) pertaining issues of critical concern to aviation, as approved by the ICAO Council at the fourth meeting of its 199th Session, held on 27 May 2013.</p>	
<i>Strategic Objectives:</i>	<ul style="list-style-type: none">• Safety• Air Navigation Capacity and Efficiency• Economic Development of Air Transport• Environmental Protection
<i>References:</i>	<ul style="list-style-type: none">• Twelfth Air Navigation Conference (AN-Conf/12), Montreal, Canada, 19 to 30 November 2012 http://www.icao.int/Meetings/anconf12/Pages/default.aspx• Regional Preparatory Workshop for International Telecommunications Union World Radiocommunication Conference (ITU WRC-15) and Twenty-eighth Meeting of the Aeronautical Communication Panel Working Group - F (ACP WG-F/28), ICAO SAM Regional Office, Lima, Peru, March 2013• Assembly – 38th Session of the Assembly, 24 September to 4 October 2013, ICAO Headquarters, Montreal, Canada• Electronic Bulletin Ref: E 3/5. 15-13/57, ICAO Position for the ITU WRC-15, 2 July 2013.

1. Introduction

1.1 The radio frequency spectrum is a scarce natural resource with finite capacity limits and for which demand is constantly increasing. The availability of the necessary radio frequency spectrum is a critical aspect for safety of civil aviation and the effective implementation of existing and future communications, navigation and surveillance systems and air traffic management.

1.2 Radio frequency spectrum congestion imposes on all users the duty of spectrum-efficient operation. The adequate allotment/assignment of frequencies for aeronautical national/international use, based on regional agreements and coordinated between States and ICAO, is an indispensable task for the optimum use of radio frequency spectrum and safety of aviation operations.

1.3 Due to the importance of this matter, States and Territories adopted the ICAO Twelfth Air Navigation Conference Assembly Recommendation 1/12 (*Development of the aeronautical frequency spectrum resource*) and the Assembly Resolution A38-6 (*Support of the ICAO policy on radio frequency spectrum matters*), urging Member States, international organizations and other civil aviation stakeholders to support firmly the ICAO frequency spectrum strategy and the ICAO position at WRCs and in regional and other international activities conducted in preparation for WRCs.

1.4 Similarly to this support, the NAM/CAR Air Navigation Implementation Working Group (ANI/WG) formulated Conclusion ANI/WG/1/10 - *Active State Support to ICAO Position for WRC-15*; urging States to include ICAO WRC-2015 Position to their ITU related meetings and the inclusion of aviation experts in the national delegations that participate in the ITU and regional preparatory activities for WRC-15. The First Eastern Caribbean Civil Aviation Technical Group Meeting (E/CAR/CATG/1) also expressed this support and formulated Conclusion 1/23.

1.5 ICAO submitted the ICAO position as approved by the ICAO Council through an electronic bulletin, Ref: E 3/5. 15-13/57, dated 2 July 2013.

2. Discussion

2.1 The process of international competition between expanding radio services, which takes place in the ITU, obliges all existing spectrum users, aeronautical and non-aeronautical alike, to continually defend and justify the retention of frequency bands or the addition of new bands to those already allocated to their service. Civil aviation requirements continue to grow, requiring more navigation and communication facilities, thus creating ever-increasing pressure to an already stretched resource, similarly to other, non-aviation users, with whom aviation shares the frequency spectrum resource. Accordingly, civil aviation must develop and present its agreed policies and its quantified and qualified statements of requirement for radio frequency spectrum, so as to ensure continuing availability and access to the frequency spectrum resource and, ultimately, the on-going viability of air navigation services throughout the world.

2.2 Major threats to aviation include the possibility of harmful interference to essential aeronautical radionavigation and radiocommunication systems. This could have a direct and severe impact on the safety as well as the efficiency of flight operations. To satisfy the future frequency spectrum needs of aviation, long term planning and engagement is required. In order to provide a proactive response to the increasing pressure of other frequency spectrum dependent industries, active participation by the aviation regulatory authorities and industry is required in the national and international fora leading to and including WRC-15.

2.3 The main points addressed by the ICAO Position for ITU WRC-15 and the ICAO Position for the ITU WRC-15 are included in the ICAO Electronic Bulletin Ref: E 3/5. 15-13/57 (**Appendix A** to this paper).

2.4 Support for the ICAO Position within States, when developing their proposals and delegation briefs in preparation to the WRC-15, is required to ensure that decisions taken by the conference are in favour of the aeronautical requirements. Therefore, it is necessary that States, territories international organizations and other civil aviation stakeholders:

- a) in preparing their proposals to the ITU WRC-15, include, to the maximum extent possible, the material contained in ICAO EB. Ref: E 3/5. 15-13/57;
- b) undertake to provide for aviation authorities to fully participate in the development of States' positions to ensure support for the ICAO Position at the WRC-15;
- c) include representatives of their civil aviation administrations and experts from aviation in their national delegations to the extent possible, when participating in the ITU-R and regional preparatory activities for WRC-15; and
- d) ensure, to the extent possible, that their delegations to the WRC-15 include representatives of their civil aviation administrations.

2.5 Assembly Resolution A38-6 Instructs the Council and the Secretary General, as a matter of high priority within the budget adopted by the Assembly, to ensure that the resources necessary to support the development and implementation of a comprehensive aviation frequency spectrum strategy as well as increased participation by ICAO in international and regional spectrum management activities are made available.

2.6 The ICAO Assembly also urged that States, territories international organizations and other civil aviation stakeholders to:

- a) working together to deliver efficient aeronautical frequency management and “best practices” to demonstrate the effectiveness and relevance of the aviation industry in spectrum management;
- b) supporting ICAO activities relating to the aviation frequency spectrum strategy and policy through relevant expert group meetings and regional planning groups; and

- c) supporting the ICAO position and the ICAO policy statements at ITU WRCs as approved by Council and incorporated in the *Handbook on Radio Frequency Spectrum Requirements for Civil Aviation* (Doc 9718)

2.7 In this regard, ICAO has undertaken several activities such as:

- a) Regional Preparatory Workshop for International Telecommunications Union World Radiocommunication Conference (ITU WRC-15) conducted to support States in the appropriate management of the frequency spectrum and preparing to support the ICAO position at ITU WRC-15. The workshop noted the importance of protecting the C- band in context with WRC-15 Agenda item 1.1 (the mobile industry is looking for over 1000 MHz of additional spectrum between 300 – 5000 MHz, and a number of aeronautical bands are under scrutiny), and that all interference cases to aeronautical VSAT must be duly recorded and documented for appropriate presentation within the ITU-R and WRC process when discussing future use and access of the Fixed Satellite-based Service (FSS) C-band. The workshop formulated several recommendations and observations for the States/Territories and International Organizations to take note. These recommendations are included on the summary of discussion of the workshop: http://www.lima.icao.int/MeetProg/mt_MeetingDocumentation.asp?wShortTitle=PREPITUWRC15&wLanguage=S&wYear=2013;
- b) introduce this topic in all the working group meetings such as the ANI/WG, E/CAR/WG and in GREPECAS;
- c) maintains a list of States Points of Contact (PoCs) in support of the ICAO WRC-15 Position for coordination and mutual support (**Appendix B**)
- d) maintains the list of Regional Frequency Assignments available to the States and public in general: ICAO Website: <http://www.icao.int/NACC/Pages/frequency.aspx>; and
- e) develop online tools for finding and Frequency Management - geo-reference evaluation of frequency planning and interferences identification

2.8 Based on the above mentioned importance to frequency spectrum support and ICAO WRC-2015, to superseded previous conclusions, the following draft conclusion is proposed:

DRAFT
CONCLUSION NACC/WG/4/xx ACTIVE SUPPORT FROM STATES FOR ICAO POSITION
FOR WRC-2015 AND

That States/Territories, in order to ensure their active support for the ICAO WRC-15 Position for the protection of the aeronautical frequency spectrum and satisfy future frequency spectrum aviation needs:

- a) include the main points addressed by the ICAO Position for ITU WRC-15, the protection of the C- band when used for Aeronautical purpose, and the ICAO WRC-15 position as a whole, when preparing your National ITU WRC-15 proposals in coordination with your National Spectrum Management Authority;
- b) include representatives from their civil aviation administrations and experts from aviation in their national delegations, to the extent possible, when participating in the International Telecommunication Union-Radio (ITU-R) and regional preparatory activities for WRC-15, and
- c) if not done so, nominate to ICAO their focal point for the WRC-2015 by **December 2014**.

3. Suggested Action

3.1 The Meeting is invited to:

- a) take note of the efforts of the States/Territories and ICAO to protect and ensure the optimum use of the aeronautical spectrum;
 - b) review and approve the draft conclusion presented in paragraph 2.8; and
 - c) take any other action as deemed necessary.
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Ref.: E 3/5.15-13/57

2 July 2013

Subject: ICAO Position for the ITU WRC-15

Action required: To consider the ICAO Position when developing your State's position for WRC-15 and to support the ICAO Position during WRC-15

Sir/Madam,

1. I have the honour to inform you that the Council, at the fourth meeting of its 199th Session, held on 27 May 2013, approved the ICAO Position on issues of critical concern to aviation which are on the agenda of the International Telecommunication Union (ITU) World Radiocommunication Conference (2015) (WRC-15) as contained in Attachment B to this letter.

2. The ICAO Position will be submitted to the ITU WRC-15. In addition, ICAO will undertake, within the budget limits of the Organization, to present the ICAO Position at the WRC-15 preparatory activities within ITU and Regional Telecommunications Organizations. However, I wish to emphasize that active support from States is **the only way** to ensure that the results of WRC-15 reflect civil aviation's continued need for spectrum. In this regard, I invite your attention to Assembly Resolution A36-25 (*Support of the ICAO Policy on radio frequency spectrum matters*) and Recommendation 1/12 (*Development of the aeronautical frequency spectrum resource*) of the Twelfth Air Navigation Conference. Kindly ensure that your administration is involved, to the fullest extent possible, in your national preparations and regional negotiations for WRC-15, and that representatives from your civil aviation administration are included in your delegation to the conference.

3. May I request that the enclosed information (Attachment B) be considered for incorporation into your State's position for WRC-15 and that your delegation to the conference be prepared to support the ICAO Position on issues of concern to international civil aviation.

Accept, Sir/Madam, the assurances of my highest consideration.

Raymond Benjamin
Secretary General

Enclosures:

- A — Summary of the main points addressed by the ICAO Position for ITU WRC-15
- B — ICAO Position for the ITU WRC-15

**Summary of the main points addressed by the ICAO Position for the
International Telecommunication Union (ITU)
World Radiocommunication Conference 2015 (WRC-15)**

Radio frequency spectrum is a scarce natural resource with finite capacity for which demand is constantly increasing. The requirements of civil aviation as well as other spectrum users continue to grow at a fast pace, thus creating an ever-increasing pressure to an already stretched resource. International competition between radio services obliges all spectrum users, aeronautical and non-aeronautical alike, to continually defend and justify retention of existing or addition of new frequency bands. The ICAO Position aims at protecting aeronautical frequency spectrum for all radiocommunication and radionavigation systems used for ground facilities and on board aircraft.

The ICAO Position addresses all radioregulatory aspects on aeronautical matters on the agenda for the WRC-15. The items of main concern to aviation include the following:

- identification of additional frequency bands for the International Mobile Telecommunications (IMT). Under this agenda item, the telecommunications industry is seeking up to 1200 MHz of additional spectrum in the 300 MHz to 6 GHz range for mobile and broadband applications. It is expected that a number of aeronautical frequency bands will come under pressure for potential repurposing, especially some of the Primary Surveillance Radar (PSR) bands. Existing frequency allocations which are vital for the operation of aeronautical very small aperture terminal (VSAT) ground-ground communication networks, especially in tropical regions, are also expected to come under pressure. Due to decisions made by a previous WRC, this has already become a problematic issue in Africa. WRC-15 agenda items 1.1 and 9.1.5 refer.
- potential radioregulatory means to facilitate the use of non-safety satellite service frequency bands for a very safety-critical application, the command and control link for remotely piloted aircraft systems (RPAS) in non-segregated airspace. The fixed satellite service bands in question are being used today to support RPAS in segregated airspace, however these frequency bands do not enjoy the freedom of interference typical of aeronautical safety allocations and there are no special measures in the Radio Regulations applicable to the protection of these frequency bands. WRC-15 agenda item 1.5 refers.
- review the continued use of the band 5 091 – 5 150 MHz by the fixed satellite service. A potential solution to this item may improve spectrum access for safety-critical aeronautical radionavigation and radiocommunication systems in this frequency band. WRC-15 agenda item 1.7 refers.
- possible aeronautical allocations to support wireless avionics intra-communications (WAIC). WAIC systems have been identified by the aerospace industry as a means to increase cost-efficiency and environmental friendliness, while maintaining required levels of safety, through the use of wireless technology, potentially making more efficient airframe designs possible. WRC-15 agenda item 1.17 refers.

In addition to WRC-15 agenda item 1.1, potential solutions to a number of other agenda items to be addressed during WRC-15 may negatively impact aeronautical spectrum. These include new allocations to the fixed and mobile satellite services (items 1.6 and 1.10), extended allocation to the earth exploration satellite service (items 1.11 and 1.12), a potential new allocation to the amateur service in the 5 MHz band (item 1.4), regulatory provisions and spectrum allocations to enable possible new maritime Automatic Identification System (AIS) technology applications (item 1.16).

Major threats to aviation include the possibility of harmful interference to essential aeronautical radionavigation and radiocommunication systems. This could have a direct and severe impact on the safety as well as the efficiency of flight operations.

**ICAO POSITION FOR THE
INTERNATIONAL TELECOMMUNICATION UNION (ITU)
WORLD RADIOCOMMUNICATION CONFERENCE 2015 (WRC-15)**

SUMMARY

This paper reviews the agenda for the ITU WRC-15, discusses points of aeronautical interest and provides the ICAO Position for these agenda items.

The ICAO Position aims at protecting aeronautical spectrum for radiocommunication and radionavigation systems required for current and future safety-of-flight applications. In particular, it stresses that safety considerations dictate that exclusive frequency bands must be allocated to safety critical aeronautical systems and that adequate protection against harmful interference must be ensured. It also includes proposals for new aeronautical allocations to support new aeronautical applications.

Support of the ICAO Position by Contracting States is required to ensure that the position is supported at the WRC-15 and that aviation requirements are met.

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3. SPECTRUM REQUIREMENTS FOR INTERNATIONAL CIVIL AVIATION
4. AERONAUTICAL ASPECTS ON THE AGENDA FOR WRC-15

Attachment

Agenda for ITU WRC-15

1. INTRODUCTION

1.1 The ICAO Position on issues of interest to international civil aviation to be decided at the 2015 ITU World Radiocommunication Conference (WRC-15) 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* (Doc 9718, Vol.1, 6th Edition - 2013) which incorporates the ICAO Spectrum Strategy and Policies and related information. Doc 9718 is available on <http://legacy.icao.int/anb/panels/acp> (see webpage: Repository). Also available at the above-mentioned website are the WRC-15 relevant ITU Resolutions referenced in the ICAO Position.

1.2 ICAO supports the working principle which was utilized in studies for WRC-07 and WRC-12. This working principle recognizes 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 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 191 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 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 15 years. In 2012, air transport directly and indirectly supported the employment of 56.6 million people, contributing over \$2 trillion to global Gross Domestic Product (GDP), and carried over 2.5 billion passengers and \$5.3 trillion worth 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) provisions are highly dependent upon sufficient availability of radio frequency spectrum that can support the high integrity and availability requirements associated with aeronautical safety systems, and demand special conditions to avoid harmful interference to these systems. Spectrum requirements for current and future aeronautical CNS systems are specified in the ICAO Spectrum Strategy¹, as addressed by the Twelfth Air Navigation Conference, and as approved by the ICAO Council.

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

¹ The ICAO spectrum strategy is incorporated in the ICAO *Handbook on Radio Frequency Spectrum Requirements for Civil Aviation, Volume 1* (Doc. 9718 – 6th Edition, to be published in 2013).

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 (UAS²) is placing 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 to meet this demand.

3.5 The ICAO Position for the ITU WRC-15 was developed in 2012 and 2013 with the assistance of the Aeronautical Communications Panel (ACP) Working Group F (frequency) and was reviewed by the Air Navigation Commission (ANC) at the seventh meeting of its 191st session on 30 October 2012. Following the review by the ANC, it was submitted to ICAO Contracting States and relevant international organizations for comment. After final review of the ICAO Position and the comments by the ANC on 30 April 2013, the ICAO position was reviewed and approved by the ICAO Council on 27 May 2013. When the ICAO Position was established, studies on a number of agenda items for WRC-15 were still on-going in the ICAO Navigation Systems Panel (NSP), the ICAO Aeronautical Communications Panel (ACP), in the ITU and in regional telecommunication organizations. These studies are to be completed prior to the WRC-15 and, if/as necessary, the ICAO position will be refined or updated taking into account the results of this on-going work.

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-15 at national level, in the activities of the regional telecommunication organizations³ and in the relevant meetings of the ITU.

4. AERONAUTICAL ASPECTS ON THE AGENDA FOR WRC-15

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.— No impact on aeronautical services has been identified from WRC-15 Agenda Items 1.2, 1.3, 1.8, 1.9, 1.13, 1.14, 1.15, 1.18, 3, 5, 6, 7, 9.2, 9.3 and 10 which are therefore not addressed in this position.

² UAS is referred to in ICAO as Remotely Piloted Aircraft Systems (RPAS)

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

WRC-15 Agenda Item 1.1

Agenda Item Title:

To consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution 233 (WRC-12);

Discussion:

This agenda item seeks to identify additional spectrum for use by terrestrial mobile communication systems to facilitate the development of terrestrial broadband applications. While the agenda item is not specific about the required RF spectrum bandwidth or the frequency bands targeted, the United States and Europe have both declared that they are intending to make at least 500 MHz of additional spectrum available for international mobile telecommunications (IMT), ideally below 6 GHz. Resolution 233 (WRC-12) identifies, in the *considering*, a number of frequency bands below 6 GHz where studies have previously been undertaken in ITU-R. Two of these frequency bands (2 700 – 2 900 MHz and 3 400 – 3 700 MHz) are of concern to aviation. It has been assumed that frequency bands below 100 MHz (and probably below 400 MHz) will not be of interest due to the cost of implementation, variability in propagation and throughput capacity.

A number of aviation systems used for the assurance of safety of flight are operating below 6 000 MHz and it is therefore essential to ensure that any new allocation to the mobile service does not adversely impact the operation of these systems. Based on recent experience with the introduction of mobile systems in the frequency band below 2 690 MHz and the remediation that was required to avoid interference to primary surveillance radar systems in the adjacent frequency band (2 700 – 2 900 MHz), care needs to be taken not only with any proposal for co-frequency band sharing of aeronautical services with non-aeronautical services but also with proposals for the introduction of new allocations in adjacent frequency bands.

The following aeronautical systems operate in the frequency range 400 – 6 000 MHz:

406 – 406.1 MHz

Emergency Locator Transmitter: Emergency locator transmitters, referred to as emergency position-indicating radio beacons (EPIRB) in the ITU, when activated transmit a distress signal which can be received by the COSPAS/SARSAT satellites and suitably equipped aircraft and vessels to facilitate search and rescue operations. Whilst there have been no recent compatibility studies, Resolution 205 was updated at WRC-12 to call for regulatory, technical and operational studies with a view to identify any required regulatory action that can be identified in the Director's report to WRC-15.

960 – 1 215 MHz

Distance measuring equipment (DME): DME is the ICAO standard system for the determination of the position of an aircraft based on the distance between that aircraft and a ground-based DME beacons within radio line of sight. Studies in Europe with respect compatibility with adjacent frequency band (below 960 MHz) IMT systems, and within ICAO with regard to co-frequency band sharing of the aeronautical mobile (R) service (AM(R)S) within the frequency band 960 – 1 164 MHz, show that any co-frequency band sharing with IMT systems would be difficult.

1 030 & 1 090 MHz

Secondary surveillance radar (SSR): SSR is the ICAO standard system that operates on two frequencies (1 030 and 1 090 MHz), used to identify the position of an aircraft based on an aircraft's response to an interrogation by the ground based element of the SSR system.

1 090 Extended Squitter (1 090ES): 1090 ES is an ICAO standard system to support automatic dependent surveillance-broadcast (ADS-B); automatically broadcasting the position and other parameters of the aircraft in order to allow other aircraft and ground facilities to track that aircraft.

Multilateration (MLAT): MLAT is the ICAO standard system used to identify the position of an aircraft based on an aircraft's transmission of a squitter or as response to an interrogation by a ground based SSR or by active MLAT.

Airborne collision avoidance system (ACAS): ACAS is the ICAO standard system operating on the same frequencies as SSR, used for the detection and avoidance of airborne conflict situations.

These systems provide for essential surveillance functions on a global basis. Although detailed studies would be required to fully assess any sharing proposals, the fact that two frequencies are used to support all of these safety-of-life systems would indicate that any sharing is unlikely to be acceptable to ICAO on safety grounds.

Universal access transceiver (UAT): UAT is an ICAO standardized system operating on 978 MHz intended to support automatic dependent surveillance-broadcast as well as ground uplink services to aircraft such as situational awareness and flight information services.

Global navigation satellite systems: The global allocation to the radionavigation satellite service in the frequency bands 1 164 – 1 215 MHz is intended to provide civil precision navigational services for various users, including aviation. Compatibility of the radionavigation satellite service and the aeronautical radionavigation service in the frequency range 960 – 1 215 MHz has been established through footnote **5.328A** and Resolutions **609** and **610**.

Aeronautical Communications Future Communication System: The frequency band 960 – 1 164 MHz was allocated to the AM(R)S for the development by ICAO of a significant component of the aeronautical future communication system. Report ITU-R **M.2235** presents compatibility studies of AM(R)S systems operating in the band 960 – 1 164 MHz with systems operating in the same frequency band, and in the adjacent frequency bands, both on-board the aircraft and on the ground.

1 215 – 1 350 MHz

Primary radar: This band, especially frequencies above 1 260 MHz, is extensively used for long-range primary surveillance radar to support air traffic control in the en-route and terminal environments. No recent studies have been undertaken with respect to compatibility with terrestrial mobile systems. Given the similarity between these radars and those operating in the frequency band 2 700 – 2 900 MHz, the results of studies in that frequency band should be applicable.

1 559 – 1 610 MHz

Global navigation satellite systems: These systems are used by the ICAO standardised satellite navigation systems for navigation in the en-route, terminal and airport environments. A number of recent studies have been undertaken within United States with respect to the compatibility between terrestrial mobile systems operating in an adjacent frequency band and satellite navigation systems. Those studies indicated that sharing was not possible.

1.5 / 1.6 GHz

Aeronautical mobile satellite communication systems: The frequency bands 1 545 – 1 555 and 1 646.5 – 1 656.5 MHz as well as the frequency band 1 610 – 1 626.5 MHz are used for the provision of ICAO standardised satellite communication services. A number of recent studies have been undertaken within Europe and United States with respect to the compatibility between terrestrial mobile systems and satellite systems in a frequency range that covers these assignments. Those studies indicated that sharing was not possible.

2 700 – 3 100 MHz

Approach primary radar: This band is extensively used to support air traffic control services at airports especially approach services. There have been a number of studies undertaken within the ITU, Europe and the United States on sharing with respect to compatibility with terrestrial mobile systems. The more recent studies are related to the introduction of mobile systems below 2 690 MHz and compatibility with radars operating above 2 700 MHz. These studies have shown significant compatibility issues which would suggest that co-frequency band sharing would be impractical. Additionally, previous technical studies in the ITU, in particular on co-channel compatibility between primary radars operating in the frequency range 2 700 – 3 100 MHz and mobile service showed that co-frequency compatibility between the terrestrial mobile service and radar systems was not feasible.

3 400 – 4 200 MHz and 4 500 – 4 800 MHz

Fixed Satellite Service (FSS) systems used for aeronautical purposes: FSS systems are used in the frequency range 3 400 – 4 200 MHz and the frequency band 4 500 – 4 800 MHz as part of the ground infrastructure for transmission of critical aeronautical and meteorological information (see Resolution **154** (WRC-12) and agenda item 9.1.5). FSS systems in the 3.4 – 4.2 GHz frequency range are also used for feeder links to support AMS(R)S systems. ITU-R Report **M.2109** contains sharing studies between IMT and FSS in the frequency range 3 400 – 4 200 MHz and frequency band 4 500 – 4 800 MHz and ITU-R Report **S.2199** contains studies on compatibility of broadband wireless access systems and FSS networks in the frequency range 3 400 – 4 200 MHz. Both studies show a potential for interference from IMT and broadband wireless access stations into FSS Earth stations at distances of up to several hundred km. Such large separation distances would impose substantial constraints on both mobile and satellite deployments. The studies also show that interference can occur when IMT systems are operated in the adjacent frequency band.

4 200 – 4 400 MHz

Radio altimeters: This frequency band is used by radio altimeters. Radio altimeters provide an essential safety-of-life function during all phases of flight, including the final stages of landing where the aircraft has to be maneuvered into the final landing position or attitude.

5 000 – 5 250 MHz

Microwave Landing System (MLS): The frequency band 5 030 – 5 091 MHz is to be used for the Microwave Landing System. MLS provides for precision approach and landing of aircraft. Future implementation of MLS is expected to be limited, mainly due to the prospect of GNSS (GBAS) offering equivalent capabilities, but where deployed, the MLS needs to be protected from harmful interference.

UAS Terrestrial and UAS Satellite communications: At WRC-12, an allocations to the AM(R)S was introduced and a footnoted aeronautical mobile satellite (R) service allocation was brought into the table of allocations in the frequency range 5 000-5 150 MHz with the view to provide spectrum for command and non-payload communications with unmanned aircraft systems. The development and implementation of these systems, taking into account the need to protect other uses in the frequency range 5 000 – 5 150 MHz is currently being considered in ICAO.

AeroMACS: Provisions for introducing systems for communications with aircraft on the surface of an airport (AeroMACS) were introduced in the Radio Regulations in 2007 in the frequency band 5 091 – 5 150 MHz. Currently ICAO is developing SARPs for implementing AeroMACS.

Aeronautical Telemetry: Provisions for introducing systems for Aeronautical telemetry were introduced in the Radio Regulations in 2007 in the frequency range 5 091 – 5 250 MHz. Aeronautical telemetry systems are currently being implemented.

5 350 – 5 470 MHz

Airborne Weather Radar: The frequency range 5 350 – 5 470 MHz is globally used 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. This use is expected to continue for the long term.

5 850 – 6 425 MHz

Fixed Satellite Service (FSS) systems used for aeronautical purposes: The frequency range 5 850 – 6 425 MHz is used by aeronautical VSAT networks for transmission (E-s) of critical aeronautical and meteorological information.

As this agenda item could impact a variety of frequency bands used by aeronautical safety services below 6 GHz it will be important to ensure that agreed studies validate compatibility prior to considering additional allocations.

ICAO Position:

To oppose any new allocation to the mobile service in or adjacent to:

- frequency bands allocated to aeronautical safety services (ARNS, AM(R)S, AMS(R)S); or
- frequency bands used by fixed satellite service (FSS) systems for aeronautical purposes as part of the ground infrastructure for transmission of aeronautical and meteorological information or for AMS(R)S feeder links, unless it has been demonstrated through agreed studies that there will be no impact on aeronautical services.

WRC-15 Agenda Item 1.4

Agenda Item Title:

To consider possible new allocation to the amateur service on a secondary basis within the band 5 250-5 450 kHz in accordance with Resolution 649 (WRC-12);

Discussion:

The frequency band 5 450 – 5 480 kHz is allocated on a primary basis to the aeronautical mobile (R) service (AM(R)S) in Region 2. The use of this band for long distance communications (HF) by aviation is subject to the provisions of Appendix 27. Any allocation made to the amateur service in the frequency band 5 250 – 5 450 kHz under this agenda item must ensure the protection of aeronautical systems operating in the adjacent frequency band 5 450 – 5 480 kHz from harmful interference.

ICAO Position:

To ensure that any allocation made to the amateur service shall not cause harmful interference to aeronautical systems operating under the allocation to the aeronautical mobile (R) service in the adjacent frequency band 5 450 – 5 480 kHz in Region 2.

WRC-15 Agenda Item 1.5

Agenda Item Title:

To consider the use of frequency bands allocated to the fixed-satellite service not subject to Appendices 30, 30A and 30B for the control and non-payload communications of unmanned aircraft systems (UAS) in non-segregated airspaces, in accordance with Resolution 153 (WRC-12);

Discussion:

ICAO Standard systems to support safe and efficient aircraft operations on a global basis are developed in accordance with the provisions of the ITU Radio Regulations. Of significant importance to aviation is that the frequency bands that support radio communication and navigation for aircraft are allocated to recognized safety services (such as the AM(R)S, the AMS(R)S or the ARNS).

This agenda item calls for studies to determine whether a system operating under an allocation to the Fixed Satellite Service (FSS), which is regarded as a non-safety service, can be used to support unmanned aircraft system (UAS⁴) control and non-payload communications (CNPC⁵) which has been determined to be a safety application. If such use is found feasible, then any resultant technical and regulatory actions should be limited to the case of UAS using satellites, as studied, and not set a precedent that puts other aeronautical safety services at risk.

The Twelfth Air Navigation Conference (AN-Conf/12) was held in November 2012, and the main theme was to redraft the global Air Navigation Plan based on the concept of Aviation System Block Upgrades (ASBU). Worldwide ICAO Air Navigation Conferences are held approximately every 10 years, and their primary goal is to establish and promote a common vision or path to ensure a safe, coherent and harmonized modernization of the Air Transport System. There was substantive discussion on spectrum, resulting in two AN-Conf/12 Recommendations (1/12 and 1/13) relevant to this WRC-15 agenda item.

At WRC-12 no new satellite allocations were made to support beyond-line-of-sight (BLOS) UAS CNPC. However the aeronautical mobile satellite (R) service (AMS(R)S) in the frequency range 5 000 – 5 150 MHz, previously allocated through footnote **5.367**, is now a table allocation and the co-ordination requirements in the frequency band 5 030 – 5 091 MHz were changed from **9.21** to **9.11A**.

The requirement for BLOS (satellite) communications (54 MHz) cannot be fulfilled in the limited spectrum available in the frequency bands 1.5/1.6 GHz, and no AMS(R)S satellite system currently operates in the frequency range 5 000 – 5 150 MHz to support current/near-term UAS CNPC.

Existing systems operating in the FSS in the unplanned frequency bands 4/6 GHz, 12/14 GHz and 20/30 GHz have spectrum capacity available that can meet the requirements for BLOS communications and could be used for UAS CNPC provided that the principles detailed below are fulfilled. However the FSS is not recognised in the ITU as a safety service. Some of these systems have been notified for registration under article **11.41**.

Standards and Recommended Practices (SARPs) for CNPC are developed in ICAO. CNPC links must meet specific Required Communications Performance (RCP) to satisfy the aviation safety requirements as identified during this development. UAS CNPC links operated on frequencies in FSS allocations would have to be validated to meet those SARPs. Command and Control communication (C2) requirements should be differentiated from ATC communications requirements since technical

⁴ UAS is referred to in ICAO as Remotely Piloted Aircraft Systems (RPAS)

⁵ CNPC is referred to in ICAO as Command and Control (C2) or Command, Control and ATC Communications (C3).

and operational constraints, as well as technological solutions, may differ. Actual UAS operations with satellite-based CNPC systems using FSS allocations are performed to date in segregated airspace. This gives some indication that FSS satellite systems operating in the frequency bands 4/6 GHz, 12/14 GHz and 20/30 GHz may have the capability of supporting UAS CNPC in non-segregated airspace as well. However regulatory measures will be required to address the conditions for UA CNPC links. In addition regulatory measures will be required to address some of the safety related conditions as detailed below.

AMS(R)S is the appropriate type of service allocation to support the satellite component for UAS command and control and ATC relay in non-segregated airspace. However, WRC-15 AI 1.5 asks for studies for the use of FSS allocations for UAS applications.

Article 15 of the Radio Regulations states that special consideration shall be given to avoiding interference on distress and safety frequencies.

In order to satisfy the requirements for BLOS communications for UAS, the use of satellite CNPC links will have to comply with the following conditions:

1. That the technical and regulatory actions should be limited to the case of UAS using satellites, as studied, and not set a precedent that puts other aeronautical safety services at risk.
2. That all frequency bands which carry aeronautical safety communications need to be clearly identified in the Radio Regulations.
3. That the assignments and use of the relevant frequency bands have to be consistent with article **4.10** of the Radio Regulations which recognizes that safety services require special measures to ensure their freedom from harmful interference.
4. Knowledge that any assignment operating in those frequency bands:
 - is in conformity with technical criteria of the Radio Regulations,
 - has been successfully co-ordinated, including cases where co-ordination was not completed but the ITU examination of probability of harmful interference resulted in favourable finding, or any caveats placed on that assignment have been addressed and resolved such that the assignment is able to satisfy the requirements to provide BLOS communications for UAS; and
 - has been recorded in the International Master Frequency Register.
5. That interference to systems is reported in a transparent manner and addressed in the appropriate timescale.
6. That realistic worst case conditions, including an appropriate safety margin, can be applied during compatibility studies.
7. That any operational considerations for UAS will be handled in ICAO and not in the ITU.

ICAO Position:

Unmanned aircraft systems (UAS) have great potential for innovative civil applications, provided that their operation does not introduce risks to the safety of life.

Taking into account Recommendations 1/12 and 1/13 of the Twelfth Air Navigation Conference (November 2012) “*That ICAO ... develop and implement a comprehensive aviation frequency spectrum strategy ... which includes the following objectives: ... clearly state in the strategy the need for aeronautical systems to operate in spectrum allocated to an appropriate aeronautical safety service*”; and “*That ICAO support studies in the International Telecommunication Union Radio Communication Sector (ITU-R) to determine what ITU regulatory actions are required to enable use of frequency bands allocated to the fixed satellite service for remotely piloted aircraft system command and control (C2) links to ensure consistency with ICAO technical and regulatory requirements for a safety service.*”, in order to support the use of FSS systems for UAS CNPC links in non-segregated airspace, the technical and regulatory actions identified by studies under **Resolution 153** (WRC-12) must be consistent with the above Recommendations, and satisfy the following conditions:

1. That the technical and regulatory actions should be limited to the case of UAS using satellites, as studied, and not set a precedent that puts other aeronautical safety services at risk.
2. That all frequency bands which carry aeronautical safety communications need to be clearly identified in the Radio Regulations.
3. That the assignments and use of the relevant frequency bands have to be consistent with article **4.10** of the Radio Regulations which recognizes that safety services require special measures to ensure their freedom from harmful interference.
4. Knowledge that any assignment operating in those frequency bands:
 - is in conformity with technical criteria of the Radio Regulations,
 - has been successfully co-ordinated, including cases where co-ordination was not completed but the ITU examination of probability of harmful interference resulted in a favourable finding, or any caveats placed on that assignment have been addressed and resolved such that the assignment is able to satisfy the requirements to provide BLOS communications for UAS; and
 - has been recorded in the International Master Frequency Register.
5. That interference to systems is reported in a transparent manner and addressed in the appropriate timescale.
6. That realistic worst case conditions, including an appropriate safety margin, can be applied during compatibility studies.
7. That any operational considerations for UAS will be handled in ICAO and not in the ITU.

WRC-15 Agenda Item 1.6

Agenda Item Title:

To consider possible additional primary allocations:

- to the fixed-satellite service (Earth-to-space and space-to-Earth) of 250 MHz in the range between 10 GHz and 17 GHz in Region 1;
- to the fixed-satellite service (Earth-to-space) of 250 MHz in Region 2 and 300 MHz in Region 3 within the range 13 – 17 GHz;

and review the regulatory provisions on the current allocations to the fixed-satellite service within each range, taking into account the results of ITU-R studies, in accordance with Resolutions 151 (WRC-12) and 152 (WRC-12), respectively;

Discussion:

This agenda item seeks to address the spectrum needs of the fixed satellite service to support projected future needs. Whilst the scope of this agenda item is limited in terms of frequency bands within which studies can take place there are a number of aeronautical systems such as Doppler navigation aids (13.25 – 13.4 GHz) and airport surface detection equipment/airborne weather radar (15.4 – 15.7 GHz) which need to be appropriately protected. Any allocation to the fixed satellite service should not adversely impact on the operation of aeronautical services in this frequency range.

ICAO Position:

To oppose any new fixed satellite service allocation unless it has been demonstrated through agreed studies that there will be no impact on aviation use of the relevant frequency band.

WRC-15 Agenda Item 1.7

Agenda Item Title:

To review the use of the band 5 091 – 5 150 MHz by the fixed-satellite service (Earth-to-space) (limited to feeder links of the non-geostationary mobile-satellite systems in the mobile-satellite service) in accordance with Resolution 114 (Rev.WRC-12);

Discussion:

In 1995 the allocation in the frequency band 5 091 – 5 150 MHz to the fixed satellite service (FSS) (Earth-to-space), limited to feeder links of the non-geostationary mobile satellite systems in the mobile satellite service, was added in order to address what at the time was perceived to be a temporary shortage of spectrum for such feeder links. To recognize the temporary nature of the allocation two clauses were added to the allocation at that time limiting the introduction of new assignments to the period up to 1 January 2008 and making the FSS secondary after the 1 January 2010. Subsequent conferences have modified these dates with the current dates being 1 January 2016 (no new frequency assignments) and 1 January 2018 (revert FSS to a secondary status) respectively.

Resolution 114 (WRC-12) calls for a review of allocations to both the aeronautical radionavigation service (ARNS) and the FSS in this band. ICAO is specifically invited to further review the detailed spectrum requirements and planning for international standard aeronautical radionavigation systems in the band. Initially this band was reserved to meet requirements for microwave landing system (MLS) assignments which could not be satisfied in the frequency band 5 030 – 5 091 MHz.

Aviation is implementing a new airport communication system under the recently allocated aeronautical mobile (R) service (AM(R)S) in the frequency band 5 091 – 5 150 MHz. Deployment and the capacity of this airport communication system is limited by the restrictions on the aggregate signal level permissible under the co-ordination arrangements established as part of agreeing to the AM(R)S allocation. Those arrangements allowed an increase in FSS satellite noise temperature ($\Delta T_s / T_s$) for the AM(R)S of 2% under the assumption that ARNS and aeronautical telemetry in the band would be contributing an additional 3% and 1% respectively. While the ARNS allocation should be maintained for the future, ARNS systems are not expected to operate in that band in the near-term, so as part of the review of the FSS allocation ICAO would wish to see a more flexible allocation of the $\Delta T_s / T_s$ between the various aeronautical services. Instead of limiting AM(R)S to 2% and ARNS to 3%, the regulations should be revised to restrict the combination of AM(R)S plus ARNS to a total of 5% $\Delta T_s / T_s$. This would allow increased flexibility for the AM(R)S while retaining the overall noise temperature increase caused by aeronautical systems operating in the band to 6%. Hence, the removal of the date limitation of the FSS can be supported, provided that stable sharing conditions with the ARNS and AM(R)S in the band are maintained and flexibility is improved in regards to $\Delta T_s / T_s$.

ICAO Position:

Support the removal of date limitations on the fixed satellite service (FSS) allocation in the frequency band 5091 – 5150 MHz subject to:

- the retention of the aeronautical protections contained in Resolution 114 (WRC-12).
- improving the flexibility for managing the allowed FSS satellite noise temperature increase by the aeronautical mobile (R) and aeronautical radionavigation services operating in the band 5 091-5 150 MHz.

WRC-15 Agenda Item 1.10

Agenda Item Title:

To consider spectrum requirements and possible additional spectrum allocations for the mobile-satellite service in the Earth-to-space and space-to-Earth directions, including the satellite component for broadband applications, including International Mobile Telecommunications (IMT), within the frequency range from 22 GHz to 26 GHz, in accordance with Resolution 234 (WRC-12);

Discussion:

A shortfall is predicted in the amount of mobile satellite spectrum available to support the satellite component of IMT, partly due to the failure to identify any spectrum that could be allocated to the mobile satellite service (MSS) below 16 GHz at WRC-12. This agenda item seeks to address these spectrum needs by identifying suitable spectrum for assignment to the MSS in the frequency range 22 – 26 GHz. Whilst the scope of this agenda item is limited in terms of frequency bands within which studies can take place, aviation does operate a number of airport surface detection systems in the frequency range 24.25 – 24.65 GHz in Regions 2 and 3 that need to be appropriately protected. Any allocation to the MSS should not adversely impact on the operation of aeronautical services in this frequency range.

ICAO Position:

To oppose any new mobile satellite service allocation unless it has been demonstrated through agreed studies that there will be no impact on aviation use in the 24.25 – 24.65 GHz frequency band in Regions 2 and 3.

WRC-15 Agenda Item 1.11

Agenda Item Title:

To consider a primary allocation for the Earth exploration-satellite service (Earth-to-space) in the 7-8 GHz range, in accordance with Resolution 650 (WRC-12);

Discussion:

Limited spectrum is available for tracking, telemetry and control systems operating in the Earth exploration-satellite service (EESS) and the available spectrum is currently in use by hundreds of satellites. This agenda item seeks to identify suitable additional spectrum for allocation to the Earth exploration-satellite service in the frequency range 7 – 8 GHz to complement the existing allocation at 8 025 – 8 400 MHz. Whilst the scope of this agenda item is limited in terms of frequency bands within which studies can take place, aviation does operate a number of airborne Doppler navigation systems in the frequency band 8 750 – 8 850 MHz that need to be appropriately protected. Any allocation to the EESS should not adversely impact on the operation of aeronautical services in the frequency band 8750 – 8850 MHz.

ICAO Position:

To oppose any new allocation to the Earth exploration-satellite service, unless it has been demonstrated through agreed studies that there will be no impact on aviation use in the frequency band 8 750 – 8 850 MHz.

WRC-15 Agenda Item 1.12

Agenda Item Title:

To consider an extension of the current worldwide allocation to the Earth exploration-satellite (active) service in the frequency band 9 300 – 9 900 MHz by up to 600 MHz within the frequency bands 8 700 – 9 300 MHz and/or 9 900 – 10 500 MHz, in accordance with Resolution 651 (WRC-12);

Discussion:

The frequency band 9 000 – 9 200 MHz is used by aeronautical radar systems (ground and airborne), including Airport Surface Detection Equipment (ASDE), Airport Surface Movement Radar (ASMR) and Precision Approach Radar (PAR) sometimes combined with Airport Surface Radar (ASR). They cater for short-range surveillance and precision functions up to a 50 km (approx. 25 NM) range. In aviation, these systems are used for precision monitoring, approach and surface detection functions and in airborne weather radar systems where their shorter wavelength is suitable for the detection of storm clouds. These radars are due to remain in service for the foreseeable future. The ongoing protection of the aeronautical uses of this frequency band needs to be assured.

Within ITU-R it has been argued that the impact on the aeronautical services has already been proven since the technical data is mainly identical to the outcome of studies performed prior to the allocation for the Earth exploration-satellite service (EESS) above 9 300 MHz by WRC-07. However the equipment types considered in the past were only un-modulated pulse Radars, rather than newer solid-state-based Radars that utilize pulse-compression modulation. The compatibility of these new Radar technologies with the EESS has not yet been analysed, however, they are being addressed in current ITU studies.

Whilst understanding that an increase in EESS synthetic aperture radar transmission bandwidth will increase the resolution with which objects can be measured, aviation would wish to understand the tangible benefits brought by such an increase in resolution before considering any allocation to the EESS. Additionally any proposals for the sharing of the aeronautical radionavigation frequency band 9 000 – 9 200 MHz by the EESS can only be considered on the basis of agreed studies, which take into account the present and expected future use of the band by aviation, and the constraints applied to this use. Such an allocation to EESS shall be subject to the provision that no harmful interference is caused to, nor protection is claimed from, or otherwise constraints are imposed on the operation and future development of aeronautical systems operating in the aeronautical radionavigation service in the frequency band 9 000 - 9 200 MHz. This provision protects the aeronautical utilization against harmful interference that may be caused when assignments are made with system characteristics different from those assumed in the compatibility analysis and interference mechanisms which were not foreseen in the compatibility analysis (for example the studies done for the 9 300 – 9 500 MHz allocation did not consider the radar systems with pulse compression).

ICAO Position:

Oppose any allocation to the Earth exploration-satellite service in the frequency band 9 000 – 9 200 MHz unless:-

- it has been demonstrated through agreed studies that there will be no impact on aviation use.
- no additional constraints are placed on the use of the frequency band by aeronautical systems

No change to Nos. **5.337**, **5.427**, **5.474** and **5.475**.

WRC-15 Agenda Item 1.16

Agenda Item Title:

To consider regulatory provisions and spectrum allocations to enable possible new Automatic Identification System (AIS) technology applications and possible new applications to improve maritime radiocommunication in accordance with Resolution 360 (WRC-12);

Discussion:

The maritime automatic identification system is fitted in search and rescue aircraft to allow coordination of search and rescue activities in which both vessels and aircraft are involved. It is 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 on the capability of search and rescue aircraft to effectively communicate with vessels during disaster relief operations.

WRC-15 Agenda Item 1.17

Agenda Item Title:

To consider possible spectrum requirements and regulatory actions, including appropriate aeronautical allocations, to support wireless avionics intra-communications (WAIC), in accordance with Resolution 423 (WRC-12);

Discussion:

The civil aviation industry is developing the future generation of aircraft. This future generation is being designed to enhance efficiency and reliability while maintaining, current required levels of safety as a minimum. The use of wireless technologies in the aircraft may reduce the overall weight of systems, reducing the amount of fuel required to fly and thus benefiting the environment.

Wireless Avionics Intra-Communications (WAIC) systems provide one way to derive these benefits. WAIC systems provide for radiocommunication between two or more points on a single aircraft and constitute exclusive closed on board networks required for the operation of an aircraft. WAIC systems do not provide air-to-ground, air-to-satellite or air-to-air communications. WAIC systems will only be used for safety-related aircraft applications.

Resolution **423** calls for consideration to be initially given to frequency bands currently allocated to aeronautical services (AMS, AM(R)S and ARNS) on a worldwide basis. If existing aeronautical bands cannot support the WAIC spectrum requirements, then new aeronautical allocations should be considered.

WAIC is a communication system which carries aeronautical safety related content and should therefore be seen as an application of the aeronautical mobile (route) service (AM(R)S). Initially the spectrum requirements for WAIC need to be identified to evaluate the possible use of existing AM(R)S allocations, and as such, if the spectrum requirements cannot be met then additional AM(R)S allocations are required.

Provided that technical studies show that WAIC systems will not cause harmful interference to existing or planned aeronautical systems in the aeronautical bands, ICAO supports any necessary additional AM(R)S allocations required to support the implementation of WAIC.

ICAO Position:

Support any necessary additional global aeronautical mobile (route) service allocation required to facilitate the implementation of WAIC, provided technical studies show that WAIC systems will not cause harmful interference to existing or planned aeronautical systems operating in frequency bands allocated to aeronautical safety services.

WRC-15 Agenda Item 4

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>
18 (Rev WRC-12)	Relating to the procedure for identifying and announcing the position of ships and aircraft of States not parties to an armed conflict	No change
20 (Rev. WRC-03)	Technical cooperation with developing countries in the field of aeronautical telecommunications	No change
26 (Rev. WRC-07)	Footnotes to the Table of Frequency Allocations in Article 5 of the Radio Regulations	No change
27 (Rev. WRC-12)	Use of incorporation by reference in the Radio Regulations	No change
28 (Rev. WRC-03)	Revision of references to the text of ITU-R recommendations incorporated by reference in the Radio Regulations	No change
63 (Rev. WRC-12)	Protection of radiocommunication services against interference caused by radiation from industrial, scientific and medical (ISM) equipment	No change
67	Updating and rearrangement of the Radio Regulations	Modify as necessary based on the results of studies carried out under WRC-15. Agenda Item 9.1
95 (Rev. WRC-07)	General review of the resolutions and recommendations of world administrative radio conferences and world radiocommunication conferences	No change
114 (Rev. WRC-12)	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	Modify as necessary based on the results of studies carried out under WRC-15. Agenda Item 1.7
151	Additional primary allocations to the fixed-satellite service in frequency bands between 10 and 17 GHz in Region 1	Delete after WRC-15
152	Additional primary allocations to the fixed-satellite service in the Earth-to-space direction in	Delete after WRC-15

<i>Resolution No.</i>	<i>Title</i>	<i>Action recommended</i>
	frequency bands between 13 – 17 GHz in Region 2 and Region 3	
153	To consider the use of frequency bands allocated to the fixed-satellite service not subject to Appendices 30, 30A and 30B for the control and non-payload communications of unmanned aircraft systems in non-segregated airspaces	Modify as necessary based on the results of studies carried out under WRC-15. Agenda Item 1.5
154	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	Modify as necessary based on the results of studies carried out under WRC-15 Agenda Item 9.1.5. Based on the outcome of the Agenda Item, potentially extend the scope to other concerned regions (Caribbean, South America, Asia Pacific)
205 (Rev. WRC-12)	Protection of the systems operating in the mobile satellite service in the band 406 – 406.1 MHz	Modify as necessary based on the result of studies carried out under WRC-15. Agenda Item 9.1.1
207 (Rev. WRC-03)	Measures to address unauthorized use of and interference to frequencies in the bands allocated to the maritime mobile service and to the aeronautical mobile (R) service	No change
217 (WRC-97)	Implementation of wind profiler radars	No change
222 (Rev. WRC-12)	Use of the frequency bands 1 525 – 1 559 MHz and 1 626.5 – 1 660.5 MHz by the mobile-satellite service, and procedures to ensure long-term spectrum access for the aeronautical mobile-satellite (R) service	No change
225 (Rev. WRC-12)	Use of additional frequency bands for the satellite component of IMT	No change
233	Studies on frequency-related matters on International Mobile Telecommunications and other terrestrial mobile broadband applications	Delete after WRC-15
339 (Rev. WRC-07)	Coordination of NAVTEX services	No change
354 (WRC-07)	Distress and safety radiotelephony procedures for 2 182 kHz	No change
356 (WRC-07)	ITU maritime service information registration	No change
360	Consideration of regulatory provisions and spectrum allocations for enhanced Automatic Identification System technology applications	Modify as necessary based on the results of studies carried out

<i>Resolution No.</i>	<i>Title</i>	<i>Action recommended</i>
	and for enhanced maritime radiocommunication	under WRC-15. Agenda Item 1.16
405	Relating to the use of frequencies of the aeronautical mobile (R) service	No change
413 (WRC-12)	Use of the band 108 – 117.975 MHz by aeronautical service	No change
417 (WRC-12)	Use of the frequency band 960 – 1 164 MHz by the aeronautical mobile (R) service	No change
418 (Rev. WRC-12)	Use of the band 5 091 – 5 250 MHz by the aeronautical mobile service for telemetry applications	Modify as necessary based on the results of studies carried out under WRC-15. Agenda Item 1.7
422	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)	Modify or suppress as necessary, subject to the completion of the work.
423	Consideration of regulatory actions, including allocations, to support Wireless Avionics Intra-Communications	Modify as necessary based on the results of studies carried out under WRC-15. Agenda Item 1.17
608 (WRC-03)	Use of the frequency band 1 215 – 1 300 MHz by systems of the radionavigation satellite service	Delete after studies completed
609 (WRC-07)	Protection of aeronautical radionavigation systems from the equivalent power flux-density produced by radionavigation satellite service networks and systems in the 1 164 – 1 215 MHz band	No change
610 (WRC-03)	Coordination and bilateral resolution of technical compatibility issues for radionavigation satellite networks and systems in the band 1 164 – 1 300 MHz, 1 559 – 1 610 MHz and 5 010 – 5 030 MHz	No change
612 (Rev. WRC-12)	Use of the radiolocation service between 3 and 50 MHz to support oceanographic radar operations	No change
644 (Rev. WRC-12)	Radiocommunication resources for early warning, disaster mitigation and relief operations	No change
705 (MOB-87)	Mutual protection of radio services operating in the band 70 – 130 kHz	No change
729 (WRC-07)	Use of frequency adaptive systems in the MF and HF bands	Delete after WRC-15
748 (Rev. WRC-12)	Compatibility between the aeronautical mobile (R) service and the fixed satellite service (Earth-to-space) in the band 5 091 – 5 150 MHz	Modify as necessary based on the results of studies carried out

<i>Resolution No.</i>	<i>Title</i>	<i>Action recommended</i>
		under WRC-15 Agenda Item 1.7
957	Studies towards review of the definitions of <i>fixed service, fixed station</i> and <i>mobile station</i>	Delete after WRC-15

Recommendations:

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

WRC-15 Agenda Item 8

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 omni-directional 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) 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**.

- c) In the frequency bands 1 610.6 – 1 613.8 MHz and 1 613.8 – 1 626.5 MHz, which is assigned to the aeronautical radionavigation service, No. **5.355** allocates the band on a secondary basis to the fixed service in a number of countries. Given that this band is allocated to a safety of life service, 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. **5.355**.
- d) In the frequency band 1 559 – 1 610 MHz, which is used for elements of the ICAO global navigation satellite system (GNSS), Nos. **5.362B** and **5.362C** allow the operation of the fixed service in some countries on a primary basis until 1 January 2010 and on a secondary basis until 1 January 2015. This band is allocated, on a worldwide, primary basis, to the aeronautical radionavigation service (ARNS) and to the radionavigation-satellite service (RNSS). The band already supports operation of two prime elements of the global navigation satellite system (GNSS), i.e. global navigation satellite system (GLONASS) and global positioning system (GPS), the standards for which have been adopted into ICAO SARPs. SARPs for other RNSS systems, such as the European Galileo system, are under development. Studies undertaken in preparation for WRC-2000 indicate that a geographical separation distance exceeding line-of-sight (in the order of 400 km) between aircraft using GNSS and stations of the fixed service is required to ensure safe operation of GNSS. This is a very severe restriction, which can prohibit the safe use of GNSS over wide areas around any fixed service installation. Were a fixed service to be introduced into this band then harmful interference situations could arise leading to disruption to GNSS, affecting the safety of aircraft in flight. Thus, the WRC-2000 agreement to terminate all use by the fixed service in this band in 2015 still constitutes a severe and unacceptable constraint on the safe and effective use of GNSS in some areas of the world. It is, therefore, recommended that deletion of these allocations be effective from 2015.
- e) In the frequency band 3 400 – 4 200 MHz, the existing allocation to the fixed satellite service (FSS) (space-Earth) is used to provide aeronautical VSAT service, see discussion under agenda items 1.1 and 9.1.5. No. **5.430A** allocates this band also to the mobile service in a number of States in Region 1, including States in Africa. African States are recommended to withdraw their names from this footnote.
- f) In the frequency band 4 200 – 4 400 MHz, which is reserved for use by airborne radio altimeters, 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. Interference from the fixed service has the potential to affect the safety of all-weather operations. 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 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 1 610.6 – 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 the deletion of Nos. **5.362B** and **5.362C** as of 2015 in order to eliminate harmful interference that has been caused by the fixed service to essential aeronautical radionavigation satellite functions in the frequency band 1 559 – 1 610 MHz and to permit the full utilization of GNSS services to aircraft on a global basis.

To support the removal of States in the African region from No. **5.430A** to ensure the protection of the safety operation of the aeronautical VSAT in the frequency band 3 400 – 4 200 MHz, where it is allocated on primary basis to the mobile service.

To support the deletion of No. **5.439** to ensure the protection of the safety critical operation of radio altimeters 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. 5.259** *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. 5.362B** *Algeria, Armenia, Azerbaijan, Belarus, Benin, Cameroon, Democratic People's Republic of Korea, Gabon, Georgia, Guinea, Guinea-Bissau, Jordan, Kazakhstan, Kyrgyzstan, Libya, Lithuania, Mali, Mauritania, Nigeria, Pakistan, Poland, Romania, Russian Federation, Saudi Arabia, Senegal, the Syrian Arab Republic, Tajikistan, Tanzania, Turkmenistan, Tunisia, Ukraine, and Uzbekistan*
- No. 5.362C** *Chad, Congo (Rep of the), Eritrea, Iraq, Israel, Jordan, Qatar, Somalia, Sudan, South Sudan, the Syrian Arab Republic, Togo, and Yemen*
- No. 5.430A** *Algeria, Saudi Arabia, Bahrain, Benin, Botswana, Burkina Faso, Cameroon, Congo (Rep. of the), Côte d'Ivoire, Egypt, French overseas departments and communities in Region I, Gabon, Guinea, Israel, Jordan, Kuwait, Lesotho, Malawi, Mali, Morocco, Mauritania, Mozambique, Namibia, Niger, Oman, Qatar, the Syrian Arab Republic, the Dem. Rep. of the Congo, Senegal, Sierra Leone, South Africa, Swaziland, Chad, Togo, Tunisia, Zambia and Zimbabwe*
- No. 5.439** *Iran (Islamic Republic of)*

WRC-15 Agenda Item 9.1

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-12.

Note: The subdivision of Agenda item 9.1 into sub-items, such as 9.1.1, 9.1.2, etc. was made at the first session of the Conference Preparatory Meeting for WRC-15 (CPM15-1) and is summarized in the BR Administrative Circular CA/201 of 19 March 2012.

Sub-item 1 (9.1.1);

Resolution 205 – Protection of the systems operating in the mobile-satellite service in the band 406 –406.1 MHz

Discussion:

This resolution calls for studies into the protection requirements of the distress and safety system operating at 406 MHz from interference and that the Director of the Radiocommunication Bureau to report any regulatory action required to WRC-15.

Emergency Locating Transmitters (ELT's) are an element of the COSPAS-SARSAT system. Mandatory carriage of ELT's for aircraft is specified in Annex 6 to the ICAO Convention. SARPs for ELTs are contained in Annex 10 to the Chicago Convention. The use of ELTs offers the possibility of dramatically shortening the time required to alert rescue forces to the distress and to assist in final "homing" by the rescue team. In the ITU, such beacons are named emergency position-indicating radio beacons (EPIRBs). ICAO supports the continued protection of this system through appropriate provisions in the Radio Regulations.

ICAO Position:

Support increased protection of COSPAS-SARSAT system in the frequency band 406 – 406.1 MHz.

Sub-item 5 (9.1.5);

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 (Resolution 154 (WRC-12))

Discussion:

The efficient provision of air navigation services requires the implementation and operation of ground communications infrastructure with high availability, reliability and integrity in order to fulfil aviation performance requirements.

In the Africa and Indian Ocean region, the difficulty of fulfilling these requirements, given the extent of the airspace and weakness in terrestrial communication infrastructure, led, in 1997, the ICAO AFI Planning and Implementation Regional Group to approve the use of fixed satellite technology (VSAT) to support terrestrial aeronautical communications services in the frequency band 3.4 – 4.2 GHz. In

tropical regions, due to more pronounced rain attenuation at higher frequency bands, this frequency band remains the only viable option for satellite links with high availability.

Since the 90s, States and / or organizations in the AFI Region have developed and implemented networks of satellite-based VSAT systems in this fixed satellite service (FSS) band. These VSAT networks support all aeronautical communications services including the extension of VHF aeronautical mobile, navigation and surveillance systems.

Today, these VSAT systems constitute a real infrastructure spanning the entire African continent and beyond and the availability of the entire 3.4 – 4.2 GHz FSS frequency band is crucial for the AFI Region to ensure the continued growth of traffic while maintaining the required level of safety in this region.

Recommendation **724**, adopted by the WRC-07, indicates that satellite communication systems operating in the fixed satellite service may be the only medium to support the requirements of the ICAO communication, navigation, surveillance and air traffic management systems, where an adequate terrestrial communication infrastructure is not available.

WRC-07 allocated the frequency band 3.4 – 3.6 GHz to the mobile, except aeronautical mobile, service on a primary basis in some countries, including Region 1, subject to regulatory and technical restrictions (No. **5.430A**). The deployment of (non-aeronautical terrestrial) mobile service systems in vicinity of airports has led to an increased number of cases of interference into the FSS (VSAT) receivers. Consequently, some additional measures need to be adopted to improve the protection of the FSS links supporting aeronautical communications.

ICAO supports ITU-R studies on the appropriate regulatory and/or technical measures that Administrations in the AFI region should apply to facilitate protection of VSATs used for the transmission of aeronautical and meteorological information in the 3.4 – 4.2 GHz frequency band from other services operating in the band. This will ensure the continued growth of traffic while maintaining the required level of safety in this region.

Note: The problem can also occur in other regions. The 3.4 – 4.2 GHz frequency range is used by VSAT networks for aeronautical communications in tropical regions of Central/South America and the Asia Pacific as well as Africa. Hence there is a potential link to WRC-15 AI 1.1.

ICAO Position:

To support possible technical and regulatory measures to ensure protection of VSATs used for the transmission of aeronautical and meteorological information in the frequency range 3.4 – 4.2 GHz from other services operating in the same or adjacent frequency range.

Sub-item 6 (9.1.6);

Resolution 957 – Studies towards review of the definitions of *fixed service*, *fixed station* and *mobile station*

Discussion:

These three definitions are indirectly related to aeronautical services and hence any change in the definitions could have an impact on the interpretation of the definition of aeronautical mobile services. This Resolution calls for studies into whether a change in the definition of these terms is required and for the Director of the Radiocommunication Bureau to report to WRC-15.

ICAO Position:

Ensure that any change to the definitions as a result of a review of the studies referenced in Resolution **957**, do not adversely impact aviation.

ATTACHMENT TO THE APPENDIX

RESOLUTION 807 (WRC-12)

Agenda for the 2015 World Radiocommunication Conference

The World Radiocommunication Conference (Geneva, 2012),

considering

- a) that, in accordance with No. 118 of the ITU Convention, the general scope of the agenda for a world radiocommunication conference should be established four to six years in advance and that a final agenda shall be established by the Council two years before the conference;
- b) Article 13 of the ITU Constitution relating to the competence and scheduling of world radiocommunication conferences and Article 7 of the Convention relating to their agendas;
- c) the relevant resolutions and recommendations of previous world administrative radio conferences (WARCs) and world radiocommunication conferences (WRCs),

recognizing

- a) that WRC-12 has identified a number of urgent issues requiring further examination by WRC-15;
- b) that, in preparing this agenda, some items proposed by administrations could not be included and have had to be deferred to future conference agendas,

resolves

to recommend to the Council that a world radiocommunication conference be held in 2015 for a maximum period of four weeks, with the following agenda:

1 on the basis of proposals from administrations, taking account of the results of WRC-12 and the Report of the Conference Preparatory Meeting, and with due regard to the requirements of existing and future services in the bands under consideration, to consider and take appropriate action in respect of the following items:

1.1 to consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution **233 (WRC-12)**;

1.2 to examine the results of ITU-R studies, in accordance with Resolution **232 (WRC-12)**, on the use of the frequency band 694-790 MHz by the mobile, except aeronautical mobile, service in Region 1 and take the appropriate measures;

1.3 to review and revise Resolution **646 (Rev.WRC-12)** for broadband public protection and disaster relief (PPDR), in accordance with Resolution **648 (WRC-12)**;

1.4 to consider possible new allocation to the amateur service on a secondary basis within the band 5 250-5 450 kHz in accordance with Resolution **649 (WRC-12)**;

1.5 to consider the use of frequency bands allocated to the fixed-satellite service not subject to Appendices **30**, **30A** and **30B** for the control and non-payload communications of unmanned aircraft systems (UAS) in non-segregated airspaces, in accordance with Resolution **153 (WRC-12)**;

1.6 to consider possible additional primary allocations:

1.6.1 to the fixed-satellite service (Earth-to-space and space-to-Earth) of 250 MHz in the range between 10 GHz and 17 GHz in Region 1;

1.6.2 to the fixed-satellite service (Earth-to-space) of 250 MHz in Region 2 and 300 MHz in Region 3 within the range 13-17 GHz;

and review the regulatory provisions on the current allocations to the fixed-satellite service within each range, taking into account the results of ITU-R studies, in accordance with Resolutions **151 (WRC-12)** and **152 (WRC-12)**, respectively;

1.7 to review the use of the band 5 091-5 150 MHz by the fixed-satellite service (Earth-to-space) (limited to feeder links of the non-geostationary mobile-satellite systems in the mobile-satellite service) in accordance with Resolution **114 (Rev.WRC-12)**;

1.8 to review the provisions relating to earth stations located on board vessels (ESVs), based on studies conducted in accordance with Resolution **909 (WRC-12)**;

1.9 to consider, in accordance with Resolution **758 (WRC-12)**:

1.9.1 possible new allocations to the fixed-satellite service in the frequency bands 7 150-7 250 MHz (space-to-Earth) and 8 400-8 500 MHz (Earth-to-space), subject to appropriate sharing conditions;

1.9.2 the possibility of allocating the bands 7 375-7 750 MHz and 8 025-8 400 MHz to the maritime-mobile satellite service and additional regulatory measures, depending on the results of appropriate studies;

1.10 to consider spectrum requirements and possible additional spectrum allocations for the mobile-satellite service in the Earth-to-space and space-to-Earth directions, including the satellite component for broadband applications, including International Mobile Telecommunications (IMT), within the frequency range from 22 GHz to 26 GHz, in accordance with Resolution **234 (WRC-12)**;

1.11 to consider a primary allocation for the Earth exploration-satellite service (Earth-to-space) in the 7-8 GHz range, in accordance with Resolution **650 (WRC-12)**;

1.12 to consider an extension of the current worldwide allocation to the Earth exploration-satellite (active) service in the frequency band 9 300-9 900 MHz by up to 600 MHz within the frequency bands 8 700-9 300 MHz and/or 9 900-10 500 MHz, in accordance with Resolution **651 (WRC-12)**;

1.13 to review No. **5.268** with a view to examining the possibility for increasing the 5 km distance limitation and allowing space research service (space-to-space) use for proximity operations by space vehicles communicating with an orbiting manned space vehicle, in accordance with Resolution **652 (WRC-12)**;

1.14 to consider the feasibility of achieving a continuous reference time-scale, whether by the modification of coordinated universal time (UTC) or some other method, and take appropriate action, in accordance with Resolution **653 (WRC-12)**;

1.15 to consider spectrum demands for on-board communication stations in the maritime mobile service in accordance with Resolution **358 (WRC-12)**;

1.16 to consider regulatory provisions and spectrum allocations to enable possible new Automatic Identification System (AIS) technology applications and possible new applications to improve maritime radiocommunication in accordance with Resolution **360 (WRC-12)**;

1.17 to consider possible spectrum requirements and regulatory actions, including appropriate aeronautical allocations, to support wireless avionics intra-communications (WAIC), in accordance with Resolution **423 (WRC-12)**;

1.18 to consider a primary allocation to the radiolocation service for automotive applications in the 77.5-78.0 GHz frequency band in accordance with Resolution **654 (WRC-12)**;

2 to examine the revised ITU-R Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with Resolution **28 (Rev.WRC-03)**, and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with the principles contained in Annex 1 to Resolution **27 (Rev.WRC-12)**;

3 to consider such consequential changes and amendments to the Radio Regulations as may be necessitated by the decisions of the Conference;

4 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;

5 to review, and take appropriate action on, the Report from the Radiocommunication Assembly submitted in accordance with Nos. 135 and 136 of the Convention;

6 to identify those items requiring urgent action by the Radiocommunication Study Groups in preparation for the next world radiocommunication conference;

7 to consider possible changes, and other options, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, an advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution **86 (Rev.WRC-07)** to facilitate rational, efficient, and economical use of radio frequencies and any associated orbits, including the geostationary-satellite orbit;

8 to consider and take appropriate action on requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required, taking into account Resolution **26 (Rev.WRC-07)**;

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

9.1 on the activities of the Radiocommunication Sector since WRC-12;

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

9.3 on action in response to Resolution **80 (Rev.WRC-07)**;

10 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,

resolves further

to activate the Conference Preparatory Meeting,

invites the Council

to finalize the agenda and arrange for the convening of WRC-15, and to initiate as soon as possible the necessary consultations with Member States,

instructs the Director of the Radiocommunication Bureau

to make the necessary arrangements to convene meetings of the Conference Preparatory Meeting and to prepare a report to WRC-15,

instructs the Secretary-General

to communicate this Resolution to international and regional organizations concerned.

APPENDIX / APÉNDICE B

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APPENDIX / APÉNDICE B

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