



Agenda Item 4: Assessment of operational requirements to determine the implementation of improvements in communications, navigation and surveillance (CNS) capabilities for operations in route and terminal area

Follow-up to ICAO Position to WRC-15 and new ICAO frequencies management tool

(Presented by the Secretariat)

SUMMARY	
This working paper presents updated information regarding the ICAO Position to the next World Radiocommunication Conference (WRC) of the International Telecommunication Union (ITU) scheduled for 2015, including the new ICAO frequencies management tool.	
References	
<ul style="list-style-type: none">• State Letter E 3/5.15-13/57 ICAO Position for the ITU WRC-15 dated 2 July 2013• State Letter E 3/5.15-15/52 Updates to the ICAO Position for the ITU WRC-15 dated 15 July 2015• ICAO Frequencies management tool Document• Handbook on Radio Frequency Spectrum Requirements for Civil Aviation DOC 9718	
<i>ICAO strategic objectives:</i>	<i>A – Safety</i> <i>B – Air navigation capacity and efficiency</i>

1. Introduction

1.1 The availability of the required radio frequency spectrum is a safety pre-requisite for civil aviation and for the effective implementation of communications, navigation and surveillance/air traffic management (CNS/ATM) systems. However, taking into account that spectrum demand by non-aviation users is constantly growing, aviation faces growing competition for the limited available spectrum, particularly from commercial telecommunication services. Modern state-of-the-art avionics for communications, radio navigation, automatic position reporting, and data link would not be able to operate without access to the radio electric spectrum.

1.2 A long-term strategy for establishing and promoting the ICAO position for International Telecommunication Union World Radiocommunication Conferences (ITU WRCs) was adopted by the ICAO Council in 2001. The strategy prescribes the development of an ICAO position on the individual issues detailed in the agenda of an upcoming WRC, developed in consultation with all ICAO Member States and relevant international organizations. The Strategy also includes a detailed ICAO policy on the use of each and every aeronautical frequency band. The policy is applicable to all frequency bands used for aeronautical safety applications.

1.3 An overall policy and a set of individual policy statements for each aviation frequency band can be found in Chapter 7 of the *Handbook on Radio Frequency Spectrum Requirements for Civil Aviation, including the Statement of Approved ICAO Policies* (Doc 9718).

1.4 Both the position and the policy are updated after each WRC and approved by the ICAO Council. The strategy for developing the position and policy can presently be found in Attachment E to Doc 9718.

1.5 The ICAO position and policy for the ITU WRC horizon extends beyond the 15-year time frame of the current GANP and anticipates the development of the future aviation system. However, based on the outcome of WRC 12, the ASBU Modules and the technology Roadmaps, and update of the strategy for frequency spectrum will be managed by ICAO to anticipate changes and define safe mechanisms for redundancy between essential components of the future air navigation system.

2. Discussion

2.1 For the appropriate radio spectrum to be available worldwide on a timely and continuous manner, aviation requirements regarding the radio frequency spectrum must be broadly supported by all ICAO Contracting States at all international fora where the issue of spectrum allotment is discussed, so as to ensure that all requirements concerning vital aviation safety services are duly presented and understood.

2.2 The original ICAO Position was sent by the Secretary General to all States under cover of State letter E 3/5.15-13/57 dated 2 July 2013. The Council, at the fifth meeting of its 205th Session, held on 17 June 2015, approved updates to the ICAO Position on issues of critical concern to aviation and authorized their transmission to ICAO Member States, relevant international organizations and to the International Telecommunication Union (ITU) World Radiocommunication Conference (2015) (WRC-15), together with relevant material as required. These items are on the agenda of the ITU WRC-15, scheduled from 2 to 27 November 2015 in Geneva, Switzerland.

2.3 Updates to the ICAO Position for the ITU WRC-15 was sent to States with State Letter E 3/5.15-15/52 dated 15 July 2015.

2.4 The updated ICAO Position will be submitted to the ITU WRC-15 for information. Active support from States is the only way to ensure that the results of the WRC-15 reflect civil aviation's need for spectrum. Therefore is essential to remember the Assembly Resolution A38-6 (*Support of the ICAO policy on radio frequency spectrum matters*) and urge you to ensure, to the fullest extent possible, that your State's delegation to the conference includes experts from your civil aviation authority and other civil aviation stake holders who are fully prepared to represent aviation interests and that civil aviation experts from your administration and other civil aviation stakeholders are involved in the national and regional preparation for the conference.

2.5 A delegation from ICAO headquarters will participate in the WRC-15 and will present the ICAO Position. The ICAO Delegation will be available to assist States by coordinating with aviation delegates as required during the course of the conference.

Relevant aspect on the ICAO position for the World Radiocommunication Conference 2015

2.6 The ICAO Position addresses all radio regulatory 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)

2.7 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, as the REDDIG II.

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

2.8 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 currently no special measures in the Radio Regulations applicable to the protection of these frequency bands.

Possible aeronautical allocations to support wireless avionics intra-communications (WAIC)

2.9 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 benefitting the environment. WAIC will only carry aeronautical safety related content between two or more points on a single aircraft.

Potential deletion of country names from footnotes to non-aeronautical services in aeronautical bands

2.10 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.

Global flight tracking for civil aviation

2.11 Spurred by the tragic disappearance of flight MH370, in October 2014 the ITU Plenipotentiary agreed to instruct WRC-15, as a matter of urgency, to consider the issue of global flight tracking for civil aviation (PP-14, Resolution 185).

2.12 In February 2015, the second ICAO High-Level Safety Conference (2nd HLSC) identified satellite based reception of automatic dependent surveillance – broadcast (ADS-B) as a future technology that could support flight tracking in oceanic and remote airspace and recommended that *ICAO should encourage States and the ITU to discuss allocation requirements at WRC-15 to provide the necessary frequency spectrum allocations to enable global air traffic services (ATS) surveillance*, using this technology.

2.13 The ICAO position for the CMR-15 is presented as Appendix to this working paper. On this respect States are invited to considerate the possibility to include the attached information in their positions to the WRC-15, and that their delegations agree to support ICAO position where the subject concern international civil aviation.

Planning criteria for allocation of frequency for the radio aeronautical communications and navigation systems

2.14 ICAO Document 9718 Handbook contains information about the requirements of civil aviation frequency radio spectrum and also contains in its Volume II the planning of frequency assignment criteria.

2.15 The CAR/SAM Air Navigation Regional Plan (Doc 8733) in its Volume I, describes the coordination and management method to keep updated lists of frequency allocation COM 1, COM 2 and COM 3 by ICAO and the States.

2.16 To assist States in the designation of frequencies on new equipment to install, ICAO has developed an online application that allows calculating the proper geographical frequency co-channel and adjacent separation. The tool is called Frequency Management and runs on a platform called File Maker Version min 13. During the meeting, the functionality of the tool will be presented.

Suggested action

3.1 The Meeting is invited to:

- a) Take note of the information presented herein;
- b) Consider the information about the updated version of the position of the ICAO for WRC 15 which is presented in section 2 and the corresponding Appendix and consider the possibility of incorporating it in the position of their State to WRC-15, and that their delegation to the Conference is willing to endorse the position of the ICAO on matters concerning international civil aviation, and
- c) deem the use of the new ICAO tool for the designation of frequencies of the new communication and navigation systems to install.

Attachment C to State letter E 3/5.15-15/52**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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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 – ICAO spectrum strategy, policy statements and related information* (Doc 9718, Volume 1, First Edition - 2014). Doc 9718 is available on <http://www.icao.int/safety/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 2014, air transport directly and indirectly supported the employment of 58 million people, contributing over \$2.4 trillion to global Gross Domestic Product (GDP), and carried over 3.2 billion passengers and 52 million tonnes of cargo.

3.2 The safety of air operation is dependent on the availability of reliable communication and navigation services. Current and future communication, navigation and surveillance/air traffic management (CNS/ATM) 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 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

¹ The ICAO spectrum strategy is included in the ICAO *Handbook on Radio Frequency Spectrum Requirements for Civil Aviation*, Volume I – ICAO spectrum strategy, policy statements and related information (Doc. 9718, Vol. 1 – First Edition, 2014).

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

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 ITU, regional telecommunication organizations as well as the ICAO Navigation Systems Panel (NSP) and the ICAO Aeronautical Communications Panel (ACP) Working Group F (WG-F)³. These studies were completed by March 2015 and an update to the ICAO Position was reviewed by the ANC on 5 May 2015 (199-3) and approved by Council on 17 June 2015 (205/5).

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 organizations⁴ 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, 3, 5, 6, 7, 9.2 and 9.3 which are therefore not addressed in this position.

³ During the ANC panel work programme review in 2013 and 2014, it was noted that ACP WG-F, responsible for drafting the ICAO Position and other material necessary to support the update of the ITU Radio Regulations, has operated as a de facto panel for a number of years. Due to the specialized nature and time criticality of the major deliverables of the tasks assigned to WG-F, those have been progressed directly to the ANC without being addressed by the ACP. Hence, in 2014 the ANC agreed that the work of WG-F should be progressed within a new Frequency Spectrum Management Panel.

⁴ 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:

ITU-R Working Parties 5A and 5D indicated a number of frequency ranges as suitable for possible future deployment of mobile broadband applications including IMT. Based on that input, the following frequency bands/ranges were identified as potential candidate bands 470-694/698 MHz; 1 350-1 400 MHz; 1 427-1 452 MHz; 1 452-1 492 MHz; 1 492-1 518 MHz; 1 518-1 525 MHz; 1 695-1 710 MHz; 2 700-2 900 MHz; 3 300-3 400 MHz; 3 400-3 600 MHz; 3 600-3 700 MHz; 3 700-3 800 MHz; 3 800-4 200 MHz; 4 400-4 500 MHz; 4 500-4 800 MHz; 4 800-4 990 MHz; 5 350-5 470 MHz; 5 725-5 850 MHz and 5 925-6 425 MHz. It should be noted that identification was solely based on three criteria: the frequency band/range had to: a) be indicated as suitable by WP5D; b) be proposed by at least one administration; and c) have been studied by the ITU-R.

The following aeronautical systems operate in or near the potential candidate frequency bands/ranges:

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.

All studies carried out were based on the parameters provided by ITU-R and show that within the same geographical area co-frequency operation of mobile broadband systems and radar is not feasible. Furthermore, there is widespread usage of this frequency range in some countries for radar. In addition, harmonized usage of all or a portion of this frequency range by mobile services for the implementation of IMT may not be feasible, in particular on a global basis. Hence none of the frequency bands in the frequency range were included in the list of potential candidate frequency bands. However, these studies could not agree on the size of the guard band required to protect radars operating in the frequency band 1 300 – 1 350 MHz. Therefore, the proposal to use the adjacent frequency band 1 350 – 1 400 MHz should be treated with caution.

In some countries the band is not fully used by radiodetermination systems, and there were studies undertaken in ITU-R which showed that sharing may be feasible in those countries subject to various mitigation measures, and to co-ordination with potentially affected neighbouring countries. However, no conclusions as to the applicability, complexity, practicability or achievability of these mitigations could be reached.

1.5 / 1.6 GHz

Aeronautical mobile satellite communication systems: Portions of the frequency bands 1 525 – 1 559 and 1 626.5 – 1 660 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 ITU-R with respect to the compatibility between terrestrial mobile systems and aeronautical satellite systems and indicated that sharing was not possible. While those bands are not identified as potential candidate bands, adjacent bands have been. Studies related to adjacent band compatibility have identified the need for IMT constraints in order to protect aeronautical satellite systems.

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-R, Europe and the United States on sharing with respect to compatibility with terrestrial mobile systems. All studies carried out were based on the parameters provided by ITU-R and show that within the same geographical area co-frequency operation of mobile broadband systems and radar is not feasible. Furthermore, there is widespread usage of this frequency range in some countries for radar. In addition, harmonized usage of all or a portion of this frequency range by mobile services for the implementation of IMT may not be feasible, in particular on a global basis.

In some countries the band is not fully used by radiodetermination systems, and there were studies undertaken in ITU-R which showed that sharing may be feasible in those countries subject to various mitigation measures, and to co-ordination with potentially affected neighbouring countries. However, no conclusions as to the applicability, complexity, practicability or achievability of these mitigations could be reached.

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. It should be noted that although adjacent frequency bands/ranges were identified as potential candidate bands, no studies were provided within ITU regarding protection of radio altimeters from unwanted emissions from IMT operating in those adjacent bands/ranges. Studies were carried out within the auspices of ICAO however, and have indicated that deployment of IMT in an adjacent band would cause interference to radio altimeters especially on approach to an airport where their operation is most critical.

ICAO Position:

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

- frequency bands allocated to aeronautical safety services (ARNS, AM(R)S, AMS(R)S);
- frequency bands allocated to RNSS and used for aeronautical safety applications; 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.

Due to the potential for serious impact to aeronautical radar systems, global and/or regional allocations to the mobile service for IMT, and/or identification for IMT, should be opposed in any portion of the potential candidate frequency bands/ranges 1 350 - 1 400 MHz and 2 700 - 2 900 MHz. Allocations/identifications on a country/multi-country basis should be contingent on successful completion of coordination with countries within several hundred kilometres of the IMT proponent country's border.

Any new allocations to the mobile service for IMT, and/or identification for IMT, in frequency bands/ranges near that used by radio altimeters (4 200 - 4 400 MHz) should be contingent on successful completion of studies to demonstrate that IMT operations will not cause harmful interference to the operation of radio altimeters.

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:

International Civil Aviation Organization (ICAO) Standard systems to support safe and efficient operation of aircraft on a global basis are developed in accordance with the provisions of the International Telecommunication Union (ITU) Radio Regulations as well as ICAO Standards and Recommended Practices (SARPs). Of significant importance to aviation is that the frequency bands that support radio communication and navigation for aircraft are allocated to appropriate aeronautical safety services (such as the AM(R)S, the AMS(R)S or the ARNS).

At WRC-12 no new satellite allocations were made to support beyond-line-of-sight (BLOS) unmanned aircraft system (UAS⁵) control and non-payload communications (CNPC⁶). However, the previous allocation of the range 5 000 – 5 150 MHz to the aeronautical mobile satellite (R) service (AMS(R)S) footnote 5.367 was replaced by 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 of between 56 and 169 MHz, as documented in Report ITU-R M.2171, likely cannot be fulfilled entirely in the AMS(R)S allocated frequency bands 1.5 / 1.6 / 5 GHz, especially as no satellite system is operational at 5 GHz in the current or near-term to support UAS CNPC.

Existing networks operating in the FSS in the unplanned frequency bands at 14/12 GHz and 30/20 GHz have potential spectrum capacity available that can meet the requirements for BLOS communications and could be used for UAS CNPC provided that the principles (conditions) detailed below are fulfilled. However, the FSS is not recognized in the ITU as a safety service and it should be noted that any consideration of operation of UAS CNPC under an allocation to the FSS must address the inconsistency with Article 1 definitions of the fixed satellite service (No. **1.21**) and aircraft earth station (No. **1.84**).

Studies within the ITU have provided information on the CNPC radio link performance under various UAS operating conditions. Other studies within the ITU also address the compatibility between this application of the FSS and other services that may be authorized by administrations.

In order to satisfy the requirements for BLOS communications for UAS, the use of satellite CNPC links will have to comply with the following seven conditions, the first three of which will have to be addressed in the ITU Radio Regulations, and the remainder in the ICAO UAS CNPC SARPs:

1. That the technical and regulatory actions be limited to the case of UAS using satellites, as studied, and not set a precedent that puts other aeronautical safety services at risk.

⁵ UAS is referred to in ICAO as Remotely Piloted Aircraft Systems (RPAS).

⁶ CNPC is referred to in ICAO as Command and Control (C2) or Command, Control and ATC Communications (C3).

Attachment C

2. That all frequency bands which carry aeronautical safety communications be clearly identified in the ITU Radio Regulations.
3. That the assignments and use of the relevant frequency bands be consistent with article **4.10** of the ITU Radio Regulations which recognizes that safety services require special measures to ensure their freedom from harmful interference.
4. That any UAS CNPC assignment operating in those frequency bands:
 - be in conformity with technical criteria of the ITU Radio Regulations,
 - be successfully co-ordinated, including cases where co-ordination was not completed but the ITU-R 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
 - be recorded in the ITU International Master Frequency Register.
5. That any harmful interference to FSS networks supporting CNPC links be reported in a transparent manner and addressed in the appropriate timescale.
6. That realistic worst case conditions, including an appropriate safety margin, be applied during compatibility studies.
7. That any operational considerations for UAS be handled in ICAO and not in the ITU-R.

ICAO SARPs for UAS CNPC are in the early stages of development, so the technical and operational requirements of satellite systems supporting those communications are not yet defined. As a result, the ITU-R actions under WRC-15 Agenda Item 1.5 should be focused on providing a regulatory framework for the safe operation of UAS CNPC links in FSS bands under the ITU Radio Regulations and thus obtaining international recognition along with the basis for avoiding harmful interference.

ICAO Position:

Recognizing that unmanned aircraft systems (UAS) have great potential for innovative civil applications, provided that their operation does not introduce risks to the safety of life, and taking into account the Twelfth Air Navigation Conference (November 2012) Recommendation 1/12⁷; and Recommendation 1/13 as amended by the 38th Assembly⁸, to ensure that 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) be consistent with the above Recommendations, and satisfy the following conditions:

1. That the technical and regulatory actions 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 be clearly identified in the ITU Radio Regulations.
3. That the assignments and use of the relevant frequency bands be consistent with article **4.10** of the ITU Radio Regulations which recognizes that safety services require special measures to ensure their freedom from harmful interference.

Additional conditions will need to be addressed in ICAO SARPs for UAS CNPC, and not in ITU.

The provisions for UAS CNPC communications links to meet the necessary technical and operational requirements for any specific airspace in any particular frequency band will be addressed within ICAO.

⁷ “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.”

⁸ “That ICAO should support studies in the International Telecommunication Union Radio Communication Sector (ITU-R) to ensure that the safety of life concerns could be sufficiently addressed. The outcome of these studies would have to provide the necessary assurance that there were no undue implications for other aeronautical systems. Provided this was the case, then it could be determined what ITU regulatory actions would be required to enable use of frequency bands allocated to the fixed-satellite service (FSS) for RPAS command and control links to ensure consistency with ICAO technical and regulatory requirements for a safety service.”

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:

To support the removal of date limitations on the fixed satellite service (FSS) allocation in the frequency band 5 091 - 5 150 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 8 750 – 8 850 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 was addressed in new ITU studies contained in Report ITU-R RS.2313. Those studies demonstrated that EESS operation in 9 000 - 9 200 MHz would not be compatible with aeronautical radar systems.

ICAO Position:

To oppose any allocation to the Earth exploration-satellite service in the frequency band 9 000 – 9 200 MHz as it has been demonstrated through agreed studies that EESS would impact aviation use and place constraints 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 co-ordination 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 constantly developing the future generation of aircraft. Each subsequent generation is being designed to enhance efficiency and reliability while maintaining or improving current required levels of safety. 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 will offer aircraft designers and operators opportunities to improve flight safety and operational efficiency with the goal of reducing costs to airlines and passengers. WAIC systems could improve an aircraft's performance over its lifetime through more cost-effective flight operations, reduction in maintenance costs, enhancement of aircraft systems that maintain or increase the level of safety, and environmental benefits. WAIC systems are also envisioned to provide new functionalities to aircraft manufacturers and operators.

Manufacturers are provided additional installation options for previously wired systems, while operators are afforded more opportunities to monitor aircraft systems. A major WAIC system application is wireless sensing. It is expected that existing and future aircraft will be equipped with such wireless sensors. These sensors could be located throughout the aircraft and will be used to monitor the health of the aircraft structure and its critical systems, and to communicate this information. WAIC systems are also intended to support data, voice and safety related video surveillance applications such as taxiing cameras and may also include communications systems used by the crew for safe operation of the aircraft. WAIC systems can provide additional opportunities to monitor more components and systems without significantly increasing the aircraft's weight.

WAIC systems provide for radiocommunication between two or more points on a single aircraft and constitute exclusive closed on board networks required for the aircraft's operation. WAIC systems do not provide air-to-ground, air-to-satellite or air-to-air communications.

WAIC is a communication system which only carries aeronautical safety related content and should therefore be seen as an application of the aeronautical mobile (route) service (AM(R)S). When initially evaluating the spectrum requirements for WAIC systems it was identified that those requirements could not be met in existing AM(R)S frequency bands, hence additional AM(R)S allocations would be required.

In accordance with Resolution 423 (WRC-12), an initial assessment was conducted, analysing potential compatibility between proposed WAIC systems and systems operating under an allocation to an incumbent service. It considered all aeronautical bands in the frequency range 960 MHz-15.7 GHz containing either an AM(R)S, AMS or ARNS allocation.

Studies were conducted analysing potential compatibility between proposed WAIC systems and systems operating under an allocation to an incumbent service in the frequency bands 2 700 - 2 900 MHz, 4 200 - 4 400 MHz, 5 350 - 5 460 MHz, 22.5 - 22.55 GHz, and 23.55 - 23.6 GHz. Of the frequency bands studied, only the frequency band 4 200 - 4 400 MHz shows that sharing is feasible. Use of the band 4 200 - 4 400 MHz by the radio navigation service is reserved for radio altimeters. Consistent with the studies contained in Report ITU-R M. 2319, the compatibility between WAIC systems and radio altimeters has been confirmed within ICAO and ITU-R Working Party 5B.

ICAO Position:

To support global aeronautical mobile (route) service allocation in the frequency band 4 200 – 4 400 MHz exclusively reserved for Wireless Avionics Intra-Communications (WAIC) systems operating in accordance with recognized international aeronautical standards.

WRC-15 Agenda Item 1.18

Agenda Item Title:

Allocation of the band 77.5 – 78 GHz to the radiolocation service to support automotive short-range high-resolution radar operations.

Discussion:

As aircraft have become larger, the ability of the captain and co-pilot to accurately taxi the aircraft around a busy airport has become more difficult and incidents of aircraft colliding with other objects on the airport have become more common. A solution has been proposed that would use off-the-shelf automotive radar located in the wing tips of aircraft to detect other ground object that might be in the path of the taxiing aircraft.

WRC-15 Agenda Item 1.18 is seeking an allocation to the radiolocation service at 77.5 - 78 GHz in order to create a contiguous piece of spectrum from 76 to 81 GHz that could support high resolution applications in the automotive industry. In order to ensure a cost effective solution for aviation to the ground taxiing issue it is essential to maintain commonality between automotive radars and those that can be fitted to aircraft. This application would operate in the radiolocation service on an advisory basis and only when the aircraft was on the airport surface.

As a result aviation would support an allocation to the radiolocation service at 77.5 - 78 GHz that is not limited in a way that would preclude the use of such radar on taxiing aircraft, noting that such an application is not regarded as a safety of life service.

ICAO Position:

To support the allocation of the frequency band 77.5 - 78 GHz to the radiolocation service in such a way as not to preclude its use on an advisory basis by taxiing aircraft.

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

<i>Resolution No.</i>	<i>Title</i>	<i>Action recommended</i>
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 frequency bands between 13 – 17 GHz in Region 2 and Region 3	Delete after WRC-15
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

<i>Resolution No.</i>	<i>Title</i>	<i>Action recommended</i>
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 and for enhanced maritime radiocommunication	Modify as necessary based on the results of studies carried out 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

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

Recommendations:

<i>Recommendation No.</i>	<i>Title</i>	<i>Action recommended</i>
7 (Rev. WRC-97)	Adoption of standard forms for ship station and ship earth station licences and aircraft station and aircraft earth station licences	No change
9	Relating to the measures to be taken to prevent the operation of broadcasting stations on board ships or aircraft outside national territories	No change
71	Relating to the standardization of the technical and operational characteristics of radio equipment	No change
75 (WRC-03)	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 (Rev. WRC-07)	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) Nos. **5.201** and **5.202** allocate the frequency bands 132 – 136 MHz and 136 – 137 MHz in some States to the aeronautical mobile (off-route) service (AM(OR)S). Since these frequency bands are heavily utilized for ICAO-standard VHF voice and data communications, those allocations should be deleted.

- c) In the frequency band 1 215 – 1 300 MHz, which is used by civil aviation for the provision of radionavigation services through No. **5.331**. Footnote No. **5.330** allocates the band in a number of countries to the fixed and mobile service. Given the receiver sensitivity of aeronautical uses of the frequency band, ICAO does not support the continued inclusion of an additional service through country footnotes. ICAO would therefore urge administrations to remove their name from the No. **5.330**.
- d) In the frequency bands 1 610.6 – 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**.
- e) 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. As both dates are now past, these footnotes should be deleted.
- f) 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.
- g) 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 Nos. **5.201** and **5.202**, as use by the AM(OR)S of the frequency bands 132 – 136 MHz and 136 – 137 MHz in some States may cause harmful interference to aeronautical safety communications.

To support deletion of No. **5.330** as access to the frequency band 1 215 – 1 300 MHz by the fixed and mobile services could potentially cause harmful interference to services used to support aircraft operations.

To support deletion of No. **5.355** as access to the frequency bands 1 610.6 – 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. 5.201** *Angola, Armenia, Azerbaijan, Belarus, Bulgaria, Estonia, the Russian Federation, Georgia, Hungary, Iran (Islamic Republic of), Iraq, Japan, Kazakhstan, Latvia, Moldova, Mongolia, Mozambique, Uzbekistan, Papua New Guinea, Poland, Kyrgyzstan, Romania, Tajikistan, Turkmenistan and Ukraine*
- No. 5.202** *Saudi Arabia, Armenia, Azerbaijan, Belarus, Bulgaria, the United Arab Emirates, the Russian Federation, Georgia, Iran (Islamic Republic of), Jordan, Latvia, Moldova, Oman, Uzbekistan, Poland, the Syrian Arab Republic, Kyrgyzstan, Romania, Tajikistan, Turkmenistan and Ukraine*
- No. 5.259** *Egypt and Syrian Arab Republic*
- No. 5.330** *Angola, Bahrain, Bangladesh, Cameroon, Chad, China, Djibouti, Egypt, Eritrea, Ethiopia, Guyana, India, Indonesia, Iran (Islamic Republic of), Iraq, Israel, Japan, Jordan, Kuwait, Nepal, Oman, Pakistan, the Philippines, Qatar, Saudi Arabia, Somalia, Sudan, South Sudan, the Syrian Arab Republic, Togo, the United Arab Emirates and Yemen*
- No. 5.355** *Bahrain, Bangladesh, Congo (Rep of the), Djibouti, Egypt, Eritrea, Iraq, Israel, Kuwait, Qatar, Syrian Arab Republic, Somalia, Sudan, South Sudan, Chad, Togo and Yemen*
- No. 5.362B** *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 1, 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 (ELTs) are an element of the COSPAS-SARSAT system. Mandatory carriage of ELTs 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:

To 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.

Attachment C

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:

To 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.

Global Flight Tracking for Civil Aviation

Resolution 185 (Busan, 2014):

To instruct WRC-15, pursuant to No. 119 of the ITU Convention, to include in its agenda, as a matter of urgency, the consideration of global flight tracking, including, if appropriate, and consistent with ITU practices, various aspects of the matter, taking into account ITU-R studies.

Discussion:

The 2014 Plenipotentiary Conference of the ITU (PP-14) adopted Resolution 185 (Busan, 2014) on global flight tracking (GFT) for civil aviation. The Resolution resolved: “to instruct WRC-15, pursuant to No. 119 of the ITU Convention, to include in its agenda, as a matter of urgency, the consideration of global flight tracking, including, if appropriate, and consistent with ITU practices, various aspects of the matter, taking into account ITU-R studies”. PP-14 further instructed the Director of the Radiocommunication Bureau to prepare a report on GFT for consideration by WRC-15. Studies within the ITU-R related to GFT are to be conducted as a matter of urgency in order to support that report.

ICAO, upon the completion of a Special Meeting on Global Flight Tracking of Aircraft in Montreal, May 2014, forged consensus among its Member States and the international air transport industry sector on the near-term priority to track airline flights, no matter their global location or destination. The meeting concluded that global flight tracking should be pursued as a matter of urgency and as a result, two groups were formed, an ICAO Ad hoc Working Group on Aircraft Tracking which developed a concept of operations to support future development of a Global Aeronautical Distress and Safety System (GADSS) and an industry-led group within the ICAO framework, the Aircraft Tracking Task Force (ATTF), that identified near-term capabilities for normal flight tracking using existing technologies.

With regard to the flight tracking technology, the ICAO Second High-level Safety Conference 2015 (HLSC 2015) noted the ATTF Report which detailed existing technologies such as automatic dependent surveillance-contract (ADS-C) which are already installed on aircraft and which could be used to perform global aircraft tracking. This range of technologies and related services will enable operators to take a performance-based approach when implementing aircraft tracking capabilities. The ATTF report contained a set of performance-based criteria that could be used to establish a baseline level of aircraft tracking capability. Additionally, the report also identified future technologies that could support flight tracking in oceanic and remote airspace such as satellite-based ADS – broadcast (ADS-B). In this regard, the conference supported that ICAO should encourage States and the ITU to discuss allocation requirements at WRC-15 to provide the necessary frequency spectrum allocations to enable global air traffic services (ATS) surveillance.

Elements of the final GFT configuration will not likely be available by WRC-15. Given the recent trend toward performance-based communications/navigation/surveillance, that final configuration may be a “system of systems” composed of both current and evolving capabilities, taking into account it must consider GFT for commercial/transport, as well as general aviation and business, aircraft. As a result, the ICAO WRC-15 position on GFT supports consideration by the Conference of all possible options as supported by studies. That could include addition of an allocation around 1 090 MHz to the aeronautical mobile satellite (R) service (AMS(R)S) to support satellite reception of ADS-B, and support of a future Conference (WRC-19) agenda item to address evolving GFT applications. Consideration should be given to ensuring new allocations do not constrain the existing aeronautical safety systems.

ICAO Position:

To support consideration of all possible options for support of ICAO global flight tracking as supported by studies. This should include:

- a new provision in the Earth-to-space direction only for an AMS(R)S allocation at 1 090 MHz for the satellite reception of existing aircraft ADS-B signals that operate in accordance with recognized international aeronautical standards under the condition that it not constrain existing aeronautical safety systems
- a future Conference (WRC-19) agenda item to address evolving GFT requirements.

WRC-15 Agenda Item 10

Agenda Item Title:

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

GLOBAL AERONAUTICAL DISTRESS AND SAFETY SYSTEM**Discussion:**

ICAO, upon the completion of a Special Meeting on Global Flight Tracking of Aircraft in Montreal, May 2014, forged consensus among its Member States and the international air transport industry sector on the near-term priority to track airline flights, no matter their global location or destination. The meeting concluded that global flight tracking should be pursued as a matter of urgency and as a result, two groups were formed, an ICAO Ad hoc Working Group on Aircraft Tracking which developed a concept of operations to support future development of a Global Aeronautical Distress and Safety System (GADSS) and an industry-led group within the ICAO framework called the Aircraft Tracking Task Force (ATTF) that identified near-term capabilities for normal flight tracking using existing technologies. While not yet complete, in combination, those efforts will address issues such as:

- Aircraft tracking under normal and abnormal conditions
- Autonomous distress tracking
- Automatic deployable flight recorder
- Procedures and information management

The collective urgency of the situation is highlighted by the decision of the ITU Plenipotentiary Conference, through Resolution 185, to instruct WRC-15, pursuant to No. 119 of the ITU Convention, to include in its agenda, as a matter of urgency, the consideration of global flight tracking, including, if appropriate, and consistent with ITU practices, various aspects of the matter, taking into account ITU-R studies. As a result, the ICAO WRC-15 position regarding global flight tracking is contained above.

With respect to the GADSS however, while the systems needed have yet to be fully defined it is anticipated that there will be a need to change the Radio Regulations in order to facilitate the introduction of such a system. It is therefore proposed that an agenda item be established for WRC-2019 that is flexible enough to address any required changes to the Radio Regulations necessary to allow the implementation of the GADSS.

ICAO Position:

To support the inclusion of an item on the agenda of a future World Radiocommunication Conference to address the needs of the global aeronautical distress and safety system.