



Agenda Item 4

Air Navigation Matters

4.2 Follow-up on the implementation of the NAM/CAR Regional Performance Based Air Navigation Plan (RPBANIP) in Eastern Caribbean

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

(Presented by the Secretariat)

SUMMARY

This working paper briefs on the current status of revision of the ICAO Position for the International Telecommunication Union (ITU) World Radiocommunication Conference (2015) (WRC-15), the proposed amendments to the ICAO policy statements which are included in the ICAO *Handbook on Radio Frequency Spectrum Requirements for Civil Aviation including Statement of Approved ICAO Policies* (Doc 9718) and a new proposed draft ICAO frequency spectrum strategy to be included in Doc 9718 and the results of the ICAO CAR/SAM workshop on Frequency management carried out in March 2013.

References:

- 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
- 24th Eastern Caribbean Directors of Civil Aviation (E/CAR/DCA/24) Meeting, Martinique, French Antilles, October 2012

Strategic Objectives

*This working paper is related to Strategic Objectives:
 A Safety – Enhance global civil aviation safety
 C Environmental Protection and Sustainable Development of Air Transport*

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 Assembly Resolution A36-25 – Support of the ICAO policy on radio frequency spectrum matters. The CAR States and GREPECAS had also supported ICAO position for the different ITU related meetings, as made in the E/CAR/DCA/23 and E/CAR/WG/33 Meetings.

1.4 The International Telecommunication Union (ITU) has scheduled the convening of a World Radiocommunication Conference (2015) (WRC-15) 2 to 27 November 2015. The development and review of the proposed ICAO Position for WRC-15 has followed the established process, as shown in the table below:

Subject	Preliminary review by ANC and WP no.	State letter and date	Final review by the ANC and WP no.	No. of replies at final review¹
Draft ICAO Position on items of interest to aviation on the agenda of the ITU WRC-15	30 October 2010 (ANC 191-7) AN-WP/8696	E 3/5-12/62 dated 28 November 2010	30 April 2013 (ANC 193-6) AN-WP/8742 and Add No. 1	41 (18) States 2 int. orgs Total: 43

¹ Number in parentheses is the number of Council Member States who have replied.

2. Discussion

Nature and Scope of the ICAO Position

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 The ICAO Position addresses all 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). 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 to 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.

2.3 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).

2.4 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.

2.5 The revised ICAO position for WRC-15 presented in **Appendix A** is being revised in the 199th Council Session for its approval as well as the amendments to the ICAO radio frequency (RF) policy statements and the new draft ICAO frequency spectrum strategy as contained in **Appendix B** for later incorporation in the Handbook on Radio Frequency Spectrum Requirements for Civil Aviation including Statement of Approved ICAO Policies (Doc 9718).

Active Support of the ICAO position

2.6 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 (Assembly Resolution A36-25 refers). Therefore, it is necessary that States:

- a) in preparing their proposals to the ITU WRC-15, include, to the maximum extent possible, the material contained in Appendix A;
- 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.

2.7 Assembly Resolution A36-25 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 increased participation by ICAO to international and regional spectrum management activities are made available. With a view to increasing the awareness of and support for the aviation requirements of ITU WRC-15, ICAO will undertake, within the budget limits of the Organization and wherever possible, to present the ICAO Position to regional telecommunication organizations, such as the Asia-Pacific Telecommunity (APT), African Telecommunication Union (ATU), 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).

Regional Preparatory Workshop for International Telecommunications Union World Radiocommunication Conference (ITU WRC-15)

2.8 ICAO carried out a Regional Preparatory Workshop for International Telecommunications Union World Radiocommunication Conference (ITU WRC-15) to support States in the appropriate management of the frequency spectrum and preparing to support the ICAO position at ITU WRC-15. The workshop informed that there are 15 items on the WRC-15 agenda which directly affect aviation and are addressed in the ICAO Position for the Conference. The outcome of four of these items may support the development of aviation spectrum; however, at least nine items may pose a direct threat to aviation spectrum allocations.

2.9 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.

2.10 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

3. Suggested Action

3.1 The Meeting is invited to:

- a) take note of the information of this paper;
- b) revise and agree on the proposed actions of paragraph 2.6; and
- c) revise the recommendations and information discussed in the Regional Preparatory Workshop for International Telecommunications Union World Radiocommunication Conference (ITU WRC-15) in paragraphs 2.8-2.10.

APPENDIX A

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

NOTES ON THE PRESENTATION OF THE PROPOSED AMENDMENT

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

- a) ~~Text to be deleted is shown with a line through it.~~ text to be deleted
- b) **New text to be inserted is highlighted with grey shading.** new text to be inserted
- c) ~~Text to be deleted is shown with a line through it~~ **followed by the replacement text which is highlighted with grey shading.** new text to replace existing text

**DRAFT 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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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 safety aspects of*

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).

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 ~~any sharing of frequency bands allocated to aeronautical safety services with co-band or adjacent band other aeronautical (safety or non-safety) services or with non-aeronautical services~~ must be considered with extreme care ~~in order to preserve the integrity of the aeronautical safety services. Where sharing conditions cannot meet the above requirements, exclusive aeronautical allocations to the aeronautical safety services need to be secured to preserve the integrity of these services.~~ 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 [yy yyyy 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 and are used to facilitate search and rescue operations. Whilst there have been no recent compatibility studies, however 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 an aircraft and a ground-based DME beacons within radio line of sight. There are no recent studies with respect to the sharing of this band with terrestrial mobile systems. 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 aircrafts' response to an interrogation by the ground based element of the SSR system.

1 090 Extended Squitter (1 090ES) Automatic dependent surveillance broadcast (ADS-B): 1090 ES ADS-B is an ICAO standard system to support automatic dependent surveillance-broadcast (ADS-B); using SSR Extended Squitter is the ICAO standard system used to automatically broadcasting the position and other parameters of the an 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 the 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. Any sharing of these frequencies, including the guard bands as established by ICAO, is not feasible.

Universal access transceiver (UAT): UAT is an ICAO standardized system operating on 978 MHz intended to support automatic dependant surveillance-broadcast as well as ground uplink services to aircraft such as situational awareness traffic 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 band 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 is being considered by ICAO for the development by ICAO of a significant component of the aeronautical future communication system, operating under the allocation to the AM(R)S in this band. Report ITU-R M.2335/2235 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.

1 525 – 1 660.5 MHz

Aeronautical mobile satellite communication systems: The frequency bands 1 545 – 1 555 and 1 646.5 – 1 656.5 MHz as well as the band 1 610 – 1 625.5 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.

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 for primary radar 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 frequency bands 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 is frequency range band 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 this frequency band 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 bands 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 band. 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 for during all phases of flight, including the final stages of landing where the aircraft has to be maneuvered into the flare-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 allocation to the AM(R)S was introduced and a footnoted ~~the~~ aeronautical mobile satellite (R) service allocation was brought into the table of allocations in the frequency range 5 000-5 150 MHz ~~were introduced or modified~~ 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 ~~band~~ 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 ~~band~~ 5 091 – 5 250 MHz. Aeronautical telemetry systems are currently being implemented.

5 350 – 5 470 MHz

Airborne Weather Radar: The frequency ~~band~~ 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 ~~the operation of~~ 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 band 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 band 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** and operate under a provisional status.

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 and operational

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).

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, under article 9 of the radio regulations (e.g. 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 all assignments used by satellite systems for the provision of UAS CNPC links are registered with favourable findings in the master international frequency register.~~
- ~~65.~~ 65. That interference to systems is reported in a transparent manner and addressed in the appropriate timescale.
- ~~76.~~ 76. That realistic worst case conditions, with the inclusion including of an appropriate safety margin, can be applied during compatibility studies.
- ~~87.~~ 87. 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, under article 9 of the radio regulations (e.g. 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 all assignments used by satellite systems for the provision of UAS CNPC links are registered with favourable findings in the master international frequency register.~~
6. That interference to systems is reported in a transparent manner and addressed in the appropriate timescale.
7. That realistic worst case conditions, with the inclusion including of an appropriate safety margin, can be applied during compatibility studies.
8. 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 band. 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 to the AM(R)S. 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 ~~those arrangements should be revisited to allow increased flexibility~~. 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 ~~frequency range~~ 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 ~~this~~ ~~the~~ frequency ~~range~~ band 8750 – 8850 MHz.

ICAO Position:

To oppose any new ~~allocation to the~~ Earth exploration-satellite service ~~allocation~~, 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 on-going 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 analyzed, 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 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 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 ~~the aeronautical bands~~.

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

<i>Resolution No.</i>	<i>Title</i>	<i>Action recommended</i>
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
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

<i>Resolution No.</i>	<i>Title</i>	<i>Action recommended</i>
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
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

<i>Resolution No.</i>	<i>Title</i>	<i>Action recommended</i>
748 (<i>Rev. WRC-12</i>)	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, 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.
- e)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 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 (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 any proposals for 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 ~~in the AFI region~~ to ensure protection of VSATs used for the transmission of aeronautical and meteorological information in the frequency range 3.4 – 4.2 GHz ~~frequency band~~ from other services operating in the ~~band~~ 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 B

**PROPOSED AMENDMENT TO THE
HANDBOOK ON RADIO FREQUENCY SPECTRUM
REQUIREMENTS FOR CIVIL AVIATION
including statement of approved ICAO Position**

NOTES ON THE PRESENTATION OF THE PROPOSED AMENDMENT

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

- a) ~~Text to be deleted is shown with a line through it.~~ text to be deleted
- b) **New text to be inserted is highlighted with grey shading.** new text to be inserted
- c) ~~Text to be deleted is shown with a line through it~~ followed by **the replacement text which is highlighted with grey shading.** new text to replace existing text

**HANDBOOK ON RADIO FREQUENCY SPECTRUM
REQUIREMENTS FOR CIVIL AVIATION
including statement of approved ICAO Position
(Doc 9718)**

*Editorial Note 1.– This Appendix indicates proposed changes to the ICAO policy statements contained in chapter 7, and the new **first draft** of a Frequency Spectrum Strategy, proposed to replace the outdated material currently contained in chapter 8 of Doc 9718. The full set of proposed amendments towards draft Edition 6 of Doc 9718, Vol I, can be found at the link below:*

http://legacy.icao.int/anb/panels/acp/repository/Handbook%20Vol%20I%2004%20April2013_CleanDraft_for_ACP_Website.zip

*Editorial Note 2.– The proposed changes to the ICAO policy statements contained in chapter 7 of Doc 9718 are consequential to the inclusion of the new **first draft** Frequency Spectrum Strategy proposed for chapter 8, and decisions taken at the International Telecommunication Union (ITU) World Radiocommunication Conference 2012 (WRC-12).*

Chapter 7

**STATEMENT OF FREQUENCY ALLOCATIONS,
TECHNICAL DETAILS AND ICAO POLICY**

...

Delete Overall Policy Statement:

OVERALL POLICY STATEMENT

ICAO POLICY

- ~~• Oppose any proposal that places undue or unreasonable constraint on aeronautical systems.~~
- ~~• Insist that any sharing studies carried out for frequency bands used by aviation take full account of the possible impact on the aeronautical safety case and that they encompass the total technical, operational and economic aspects of aeronautical system use.~~
- ~~• 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 systems will be addressed in ITU, with the assistance of ICAO as required.~~

The above policy statement is applicable to all frequency bands, and should be regarded as implicit in the policy statements for all bands used by civil aviation.

End of deleted policy statement.

Rationale: This statement is now contained within the new draft Spectrum Strategy proposed for insertion as a new Chapter 8 of Doc 9718, introduced later in this Appendix.

Band: 90–110 kHz

Service: Radionavigation (Loran-C)

Allocation:

...

ICAO POLICY

- ~~Retain the allocation to the radionavigation service and Footnote 5.62.~~
- ~~Support deletion of the fixed service and Footnote 5.64 as envisaged in Resolution 706.~~

...

Rationale: There are no aeronautical requirements to retain the Loran-C service.

Band: 130–535 kHz

Service: Aeronautical radionavigation (NDB/~~locator~~)

Allocation:

...

ICAO POLICY

- No change to 5.70, 5.80 and 5.86.
- In regions where the global navigation satellite system (GNSS) is implemented and non-directional radio beacon (NDB) assignments are withdrawn from international and national usage, aviation requirements for spectrum in these bands may be reduced.
- Until NDBs have been phased out, the current allocations to the aeronautical radionavigation service must be safeguarded.
- ~~Ensure that any allocation made under WRC-12 Agenda Item 1.23 does not cause harmful interference to the operation of aeronautical systems operating under allocations to the aeronautical radionavigation service.~~

...

Rationale: The bullet proposed for deletion reflects an item that was successfully resolved during WRC-12.

Band: 2 850 - 22 000 kHz

Service: AM(R)S (air-ground communications (HF voice and data))

Allocation:

...

ICAO POLICY

- Retain the current allocations in the HF bands to the aeronautical mobile (route) service (AM(R)S) bands and the provisions of Appendix 27 to the Radio Regulations for the foreseeable future for HF voice and data.
- Protect the use of the aeronautical HF bands in accordance with the provisions of Appendix 27.
- No change to Footnotes 5.111 and 5.115.
- Support the measures and participate in the technical studies addressed in Resolution 207 (Rev. WRC-03) concerning the unauthorized use of and interference to frequencies in the bands allocated to the AM(R)S
- Consider technical solutions which can be implemented efficiently without changes to aircraft equipment or disruption of aeronautical services.

...

Rationale: Clarification.

Band: 74.8–75.2 MHz

Service: Aeronautical radionavigation (marker beacon)

Allocation:

...

ICAO POLICY

- No change to the current allocations.
- No change to Footnote 5.180.
- Deletion of Footnote 5.181.

...

No change.

Band: 108–117.975 MHz

Service: Aeronautical radionavigation (VOR/ILS localizer) and Aeronautical mobile (Route) service (GBAS/VDL Mode 4)

Allocation:

...

ICAO POLICY

- No change to the current allocation to the aeronautical radionavigation service and the aeronautical mobile (route) service (AM(R)S).
- Deletion of Footnote 5.197.
- Ensure conformity with ITU-R Recommendation SM.1009 regarding compatibility with FM broadcast services in the band 87.5–108 MHz and ILS/VOR and as well as with ITU-R Recommendation M.1841 for GBAS.
- ~~Support studies associated with ITU-R Resolution 413 (Rev. WRC-07) in order to facilitate the use of the frequency band by AM(R)S systems that operate in accordance with international standards~~

...

Rationale: The bullet proposed for deletion reflects an item that was successfully resolved during WRC-12.

Band: 117.975–137 MHz

Service: AM(R)S (air-ground and air-air communications (VHF voice and data))

Allocation:

...

ICAO POLICY

- No change to the allocations to the aeronautical mobile (route) service in this band.
- No changes to Footnote 5.200.
- No changes to the provisions relating to the use of the emergency channels 121.5 and 123.1 MHz.
- Promote measures for the deletion of Footnotes 5.201 and 5.202.

...

Frequencies: 121.5 MHz, 123.1 MHz and 243 MHz (mobile)

Service: AM(R)S

Emergency frequency in mobile service (243 MHz)

...

ICAO POLICY

No change to the provisions in Chapter VII relating to the use of 121.5 MHz, 123.1 MHz and 243 MHz.

...

No change.

Band: 328.6–335.4 MHz

Service: Aeronautical radionavigation (ILS glide path)

Allocation:

...

ICAO POLICY

- No change to current allocation to the aeronautical radionavigation service.
- No change to Footnote 5.258.
- Deletion of Footnote 5.259.

...

No change.

Band: 406–406.1 MHz

Service: Mobile-satellite (Earth-to-space) (search and rescue)

Allocation:

...

ICAO POLICY

- No change to the allocation to the band 406–406.1 MHz and Footnotes Nos. 5.266 and 5.267.
- Secure protection of emergency locator transmitters (ELTs) which are used in aviation in this frequency band.

...

No change.

Band: 960–1 215 MHz

Service: Aeronautical radionavigation/radionavigation satellite and Aeronautical Mobile (Route) Service (DME/SSR/ACAS/GNSS/1090ES/UAT)

Allocation:

...

ICAO POLICY

- No change to the current allocation to the aeronautical radionavigation service or to Footnote 5.328 in the band 960–1 215 MHz.
- No change to Footnote 5.328A.
- No change to the aeronautical mobile (route) service (AM(R)S) allocation or to Footnote 5.327A in the band 960–1 164 MHz with the exception of possible changes to ITU-R Resolution 417.
- ~~Support studies associated with ITU-R Resolution 417 in order to facilitate remove the restrictions on the use of the frequency band by AM(R)S due to non-ICAO standardized systems that operate in accordance with recognized international aeronautical standards from ITU-R Resolution 417.~~

...

Rationale: A new allocation to the AM(R)S, in support of a future air/ground communications system (LDACS) was agreed in the frequency band 960 – 1 164 MHz during WRC-12. In the geographical neighbourhood of certain former eastern-bloc States and China (see Resolution 417 for full list), this frequency band is shared with a non-ICAO standardized aeronautical radionavigation system (ARNS). Current restrictions in ITU Resolution 417 specify a coordination threshold of 465 km from the borders of these States for any AM(R)S operation in this frequency band in the neighbourhood of the States concerned. It is desirable to remove this restriction in the future.

Band: 1 215–1 400 MHz

Service: Radionavigation/aeronautical radionavigation/radiolocation/radionavigation-satellite
(RNSS/primary surveillance radar)

Allocation:

...

ICAO POLICY

- No change to **the status of** the allocation to the radionavigation service in Footnotes 5.331 and 5.334.
- No change to Footnote 5.332.
- No change to the provisions of Footnotes 5.329 and 5.337A ~~for~~ **regarding the** protection of radar stations from the radionavigation-satellite service.
- Support further ITU-R studies relating to Resolution **608**.

...

Rationale: Editorial.

Bands: Mobile-satellite bands 1 525–1 559 MHz and 1 626.5–1 660.5 MHz

Service: AMS(R)S (satellite communications)

...

ICAO POLICY

- Support the establishment of adequate technical and regulatory procedures to:
 - a) guarantee access to spectrum in these bands for aeronautical communications as required; and
 - b) ensure that aeronautical communications in categories 1 to 6 of Article 44 are given priority and immediate access at all times.
- If acceptable procedures cannot be established, recover the exclusive allocation of the bands 1 545–1 555 MHz and 1 646.5–1 656.5 MHz to the AMS(R)S.
- If required, modify Footnotes 5.357A and 5.362A to strengthen AMS(R)S access to the bands.
- No change to Footnotes 5.357 and 5.376.
- Support the deletion of Footnotes 5.355 and 5.359.
- Provide support to the procedure to implement Footnote 5.357A and Resolution 222 (Rev. WRC-12)
- Support studies with respect to Resolution 222 (WRC-07~~12~~).

...

Rationale: WRC-12 resolved the long standing issue of potentially insufficient access to these frequency bands due to a weak protection of aeronautical priority access in the relevant frequency assignment procedures, as referenced in Footnote **5.357A** and Resolution 222 of the ITU Radio Regulations.

Band: 1 559–1 626.5 MHz

Service: Aeronautical radionavigation/Radionavigation satellite/Mobile satellite (GNSS)

Allocation:

...

ICAO POLICY

- No change to the allocation to the radionavigation-satellite service in the band 1 559–1 610 MHz.
- 1 559–1 610 MHz: No change to the use of this band for future GNSS elements, including GLONASS and GPS which must be protected.
- No new allocations to be made in the band 1 559–1 610 MHz.
- No change to Footnotes 5.364, 5.365, 5.366, 5.367 and 5.368.
- Delete Footnotes 5.362B and 5.362C from these bands on the grounds that the allocation to the fixed service is not compatible with the safe operation of ICAO GNSS services.
- Delete Footnote 5.371.

...

No change.

Band: 2 700–3 300 MHz

Service: Aeronautical radionavigation/Radionavigation/Radiolocation (primary surveillance radar)

Allocation:

...

ICAO POLICY

- No change to the frequency allocations to the aeronautical radionavigation service in these bands.
- No change to Footnotes 5.423, 5.424A, 5.426 and 5.427.
- Oppose any in-band or near-band allocation that would endanger the operation of radar services including those potentially being considered for International Mobile Telecommunications/ mobile broadband under ITU-R Resolution 233.
- Given the pressure on the use of this frequency band from non-aeronautical sources and in support of the ICAO Overall Policy Statement:
 - a) insist that any sharing studies carried out encompass the total technical and operational aspects of radar use, including possible impact on the safety case; and
 - b) oppose any proposal that places undue or unreasonable economic penalty on radar systems presently in use.
- ~~Until studies have shown compatibility of Electronic News Gathering (ENG) with radar systems operating in the frequency band 2 700–3 300 MHz, oppose any allocation which is identified for use by ENG as being considered under ITU R Resolution 954 in this band.~~

...

Rationale: WRC-15 will consider a potential allocation of 500 – 1200 MHz of spectrum to the International Mobile Telecommunications / Mobile Broadband services. One of the aeronautical allocations that may potentially be considered for these services is the 2700 – 3300 MHz band. This band, in particular 2 700 – 2 900 MHz, is heavily used for aeronautical Primary Surveillance Radar in many States. The issue of Electronic News Gathering was successfully resolved during WRC-12.

Band: 4 200–4 400 MHz

Service: Aeronautical radionavigation (radio altimeter)

Allocation:

...

ICAO POLICY

- No change to the allocation to the radionavigation service in the light of the continuing requirement for radio altimeters to operate in this band and of the results of ITU-R studies indicating that 200 MHz is required to meet the stringent operational requirements for accuracy and integrity for radio altimeters.
- No change to 5.438 which could constrain the operation of radio altimeters.
- Oppose any in-band or near-band allocation that would endanger the operation of the aeronautical radionavigation service including those allocations that may potentially be considered for International Mobile Telecommunications/mobile broadband under ITU-R Resolution 233.
- Delete 5.439.

...

Rationale: WRC-15 will consider a potential allocation of 500 – 1200 MHz of spectrum to the International Mobile Telecommunications / Mobile Broadband services. One of the aeronautical allocations that may potentially be affected by an allocation to these services is the 4 200 – 4 400 MHz band, allocated to use by radio altimeters. Radio Altimeters provide an essential safety of life function for all phases of flight, including the final stages of landing where the aircraft has to be maneuvered into the flare position or attitude.

Band: 5 000–5 250 MHz

Service: Aeronautical radionavigation (MLS), Aeronautical Mobile (R) (airport communications, terrestrial UAS) and Aeronautical Mobile Satellite (R) (UAS)

Allocation:

...

ICAO POLICY

- No change to footnotes 5.444 and 5.444A.
- If necessary, support changes to Footnotes 5.367 and 5.444B in order to facilitate the implementation of aeronautical mobile (route) service (AM(R)S) and aeronautical mobile-satellite (route) service (AMS(R)S) systems.
- Apply the methodology contained in ITU-R Recommendation S.1342 on the coordination of microwave landing system (MLS) with fixed-satellite service (FSS) earth stations in the band 5 091–5 150 MHz.
- Support studies under ITU-R Resolution 420¹¹⁴ in order that they can be completed by ~~WRC-12~~WRC-15.
- Ensure that in addressing the future use of the frequency band 5 091-5 150 MHz by the FSS current and intended future use by aeronautical systems are not adversely impacted.

...

Rationale: WRC-15 agenda item 1.7 will address the potential abrogation of a time limitation for the continued access to the frequency band 5 091 – 5 150 MHz by the Fixed Satellite Service (FSS) (earth-Space). The FSS (earth-Space) is compatible with the Microwave Landing System (MLS) and the new high data-rate AeroMACS system currently being standardized by ICAO for operation in this frequency band. However it is important to ensure continued stable or improved sharing conditions for the aeronautical safety services in the band.

Band: 5 350–5 470 MHz

Service: Aeronautical radionavigation (airborne weather and ground mapping radar)

Allocation:

...

ICAO POLICY

- No change to footnotes 5.448B, 5.448C and 5.448D.
- These bands are used extensively, particularly for airborne weather radar, and are needed for the foreseeable future. No changes should be made which would restrict this aeronautical use.

...

No change.

Band: 8 750–8 850 MHz

Service: Aeronautical radionavigation/Radiolocation (airborne Doppler radar)

Allocation:

...

ICAO POLICY

- No change since the requirement is a continuing one.
- No change to Footnote 5.470.

...

No change.

Band: 9 000 – 9 500 MHz

Service: Aeronautical radionavigation/Radionavigation (precision approach radar, airborne weather and ground mapping radar)

Allocation:

...

ICAO POLICY

- Oppose any changes to the allocations that could adversely affect their use by aviation.
- No change to Footnotes 5.337, 5.427, 5.473A, 5.474, 5.475, 5.475A, 5.475B and 5.476A.
- Support studies under ITU Resolution 651 in order that they can be completed by WRC-15
- Ensure that proposals to extend the earth exploration satellite service into the frequency band 9 000-9 200 MHz do not adversely impact the use of the frequency band by airport surface movement radar.

...

Rationale: The band 9 000 – 9 200 MHz is used for ground based primary surveillance radar (PSR) systems, including Precision Approach Radar (PAR) and airport surveillance detection equipment (ASDE). WRC-15 will consider the potential sharing of the frequency band 9 000 – 9 200 MHz with the Earth Exploration Satellite Service (WRC-15 Agenda Item 1.12). ITU Resolution 651 specifies the scope of the studies to be performed by the ITU-Radiocommunication Sector (ITU-R) in preparation for the conference.

Band: 13.25 – 13.4 GHz

Service: Aeronautical radionavigation (airborne Doppler radar)

Allocation:

...

ICAO POLICY

- No change to the allocations as there is a continuing aeronautical requirement for this band.
- No change to 5.497.
- Oppose any changes to the allocations that could adversely affect their use by aviation as a result of studies undertaken in response to ITU Resolutions 151 and 152.

...

Rationale: The band 13.25 – 13.4 GHz is extensively used for airborne Doppler radar and ground mapping radar. WRC-15 will consider the potential sharing of these frequency bands with the fixed satellite service (WRC-15 Agenda Item 1.6). ITU Resolutions 151 and 152 specify the scope of the studies to be performed by ITU-R in preparation for WRC-15.

Band: 15.4 – 15.7 GHz

Service: Aeronautical radionavigation (ASDE/airborne weather radar, other systems)

Allocation:

...

<p>ICAO POLICY</p> <ul style="list-style-type: none"> • No change to the allocation to the aeronautical radionavigation service. • No change to Footnotes 5.511A, 5.511C and 5.511D which would introduce further restrictions to aeronautical use of this band. • Support studies in relation to ITU R Resolution 614 regarding the possible primary allocation to the radiolocation service.

...

Rationale: The issue proposed for deletion was successfully resolved during WRC-12.

Band: 24.25 – 24.65 GHz

Service: Radionavigation (ASDE)

Allocation:

...

<p>ICAO POLICY</p> <ul style="list-style-type: none"> • No change to the radionavigation allocations in Region 2 and Region 3.
--

...

No change.

Band: 31.8–33.4 GHz

Service: Radionavigation (ASDE)

Allocation:

...

<p>ICAO POLICY</p> <ul style="list-style-type: none"> • No change to the radionavigation allocations.

...

No change.

**ICAO Policy on Chapter I of the Radio Regulations (Articles 1 to 3),
Terminology and technical characteristics:**

...

ICAO POLICY ON CHAPTER I

- No changes should be made to the Regulations of importance to aeronautical services as identified above.
- Service merging of aeronautical radionavigation in the world- wide allocations where an ICAO standard system operates with other radiodetermination services is not practicable without prejudicing the service of the aeronautical system.
- Service merging of aeronautical mobile service allocations with other services is not possible due to the radically different operational requirements.
- ~~The feasibility of the generic allocation to all mobile satellite services, as in the Final Acts of WRC 97, must be regarded as unproven for aviation use, until the studies under Resolutions 218 (WRC 97) and 222 (WRC 07) have been completed.~~

...

Rationale: The issue of non-sufficient assurance of priority to the aeronautical mobile satellite (route) service was successfully resolved by an update to Resolution 222 (WRC-12).

**ICAO Policy on Chapter II of the Radio Regulations (Articles 4 to 6),
Frequencies:**

...

ICAO POLICY ON CHAPTER II

- Article 4: maintain these Regulations, particularly RR 4.10, without any change in substance.
- Article 5: see Section 7-II of this handbook.
- Article 6: maintain these Regulations without change

...

No change.

**ICAO Policy on Chapter III of the Radio Regulations (Articles 7 to 14),
Coordination, notification and recording of frequency assignments and Plan modifications:**

...

ICAO POLICY ON CHAPTER III

Maintain these Regulations without change.

Continue the assessment on aligning the ITU database of frequency assignments with the ICAO global frequency lists.

...

Rationale: The Master International Frequency Register (MIFR), maintained by ITU on behalf of the frequency spectrum authorities of its 193 Member States is used to manage and ensure the compatibility of frequency assignments on a worldwide basis. Traditionally aeronautical frequency management, in particular in the VHF band (108 – 137 MHz), is performed by aeronautical authorities of States, and it has been observed that the information in the MIFR is not up to date. Currently this situation and potential ways to improve it, are being considered by the ITU Secretariat, supported by ACP WG-F and the ICAO Secretariat.

**ICAO Policy on Chapter IV of the Radio Regulations (Articles 15 and 16),
Interferences:**

...

ICAO POLICY ON CHAPTER IV

This chapter contains Regulations of importance to aeronautical services which provide for the rapid clearance of interference to these services. No changes of substance should be made, and the degree of attention accorded to safety services and distress frequencies should not be lessened

...

No change.

**ICAO Policy on Chapter V of the Radio Regulations (Articles 17 to 20),
Administrative provisions:**

...

ICAO POLICY ON CHAPTER V

Chapter V, which addresses identification signals and call signs, is the basic international document for these matters. Alignment with Annex 10 is essential and must be maintained either through similar text or by exemption (e.g. RR 19.10).

...

No change.

**ICAO Policy on Chapter VI of the Radio Regulations (Articles 21 to 29),
Provisions for services and stations:**

...

ICAO POLICY ON CHAPTER VI

- The provisions in the chapter are necessary as broad principles for radiodetermination services. They should be maintained and improved, as necessary, by future amendments based on practical experience.
- Appendix 12, together with the enabling provisions 28.23 and 28.24, should be maintained unchanged.

...

No change.

**ICAO Policy on Chapter VII of the Radio Regulations (Articles 30 to 34),
Distress and safety communications:**

...

ICAO POLICY ON CHAPTER VII

Chapter VII concerns primarily the global maritime distress and safety system (GMDSS), but affects aircraft indirectly. These provisions (identified above) should be maintained, or improved as necessary, based on operational practices.

...

No change.

**ICAO Policy on Chapter VIII of the Radio Regulations (Articles 35 to 45),
Aeronautical services:**

...

ICAO POLICY ON CHAPTER VIII

- Resolution 713 (WRC-95) calls for study of the operational provisions in the Radio Regulations. Although not explicitly stated, the implication that ICAO documents could become the international agreement on certain operational matters is present. ICAO policy supports this idea for these Regulations which relate purely to operational practices.
- Maintain Article 35 except for any consequential amendment.
- Maintain Article 43 without change.
- Maintain the order of priority in Article 44 for Categories 1 to 6 aligned with that in Annex 10.
- Maintain other parts of Chapter VIII without change until the studies under Resolution 713 (WRC-95) are completed and discussed.

...

No change.

**ICAO Policy on Chapter IX of the Radio Regulations (Articles 46 to 58),
Maritime services:**

...

ICAO POLICY ON CHAPTER IX

Maintain the aeronautical provisions in this chapter without change.

...

No change.

ICAO Policy on Appendices to the Radio Regulations:

...

ICAO POLICY ON APPENDIX 12

No changes should be made to the provisions for aeronautical radio beacons in this Appendix.

...

ICAO POLICY ON APPENDIX 16

Retain without change.

...

ICAO POLICY ON APPENDIX 27

- Appendix 27 may only be amended by an ITU aeronautical conference or by an agenda item for a WRC to which aeronautical expertise is specifically invited. The present Allotment Plan is becoming incapable of meeting requirements, which appear to exceed the possibilities under provision 27/20.
- ICAO supports any action which could lead to an increase of the frequency bands for use by the aeronautical mobile (route) service (AM(R)S) in the bands between 2 850 and 22 000 kHz.

No change.

Note:- The material below replaces the current contents of Chapter 8, Doc 9718, in its entirety:

Chapter 8

ICAO SPECTRUM STRATEGY

8.1 INTRODUCTION

8.1.1 Air transport plays a major role in social and economic development of communities, regions and the world. The demand for passenger and freight operations is expanding geographically and growing in response to markets and demographics. Studies conducted in North America, Europe and the Pacific areas predict very similar patterns of activity in the years ahead, with air traffic movements expected to increase at an average annual rate of 4.6 per cent up to the year 2025.

8.1.2 The ICAO spectrum strategy presented in section 8.2 below is based on the recognition that adequate and appropriate spectrum availability is essential to aviation safety and to support efficient aircraft operations. This fundamental principle has been the long-standing basis for ICAO policy in spectrum matters, as recognized in Assembly Resolution 36-25 and more recently in Recommendation 1/12 of the Twelfth Air Navigation Conference.

8.1.3 The ICAO spectrum strategy is consistent with the Fourth Edition of the *Global Air Navigation Plan* (GANP, ICAO Doc 9750), and in particular with the Technology Roadmaps contained in Appendix 5 of the plan. Future developments of the plan will be taken into account as part of the strategy update process, as discussed in section 8.3 below, which addresses future systems and strategy evolution.

8.1.4 Section 8.4 below discusses a number of current and future challenges to civil aviation's use of the radiofrequency spectrum.

8.2. ICAO SPECTRUM STRATEGY

8.2.1 Purpose of the ICAO spectrum strategy

8.2.1.1 The safety aspects on the use of radio frequency spectrum by aviation require spectrum to be available on an exclusive basis or, when shared with non-aeronautical radio services, with regulatory and technical conditions that recognize aeronautical safety requirements. The overall ICAO spectrum policy includes the ICAO spectrum strategy presented here and the ICAO policy statements contained in Chapter 7. Both the spectrum strategy and the policy statements are approved by the ICAO Council.

8.2.1.2 Implementation of the spectrum strategy will enable the advancement of technological developments and innovation to enhance safe and efficient global air transport. This is to be achieved through the development of ICAO SARPs as necessary.

8.2.1.3 The radio frequency spectrum capacity for aviation must be sufficient to meet the growing needs for aeronautical communication, navigation and surveillance systems, including any new systems that are being considered in ICAO to meet future CNS/ATM requirements. This is essential to adequately support changing trends air traffic management such as foreseen in the *Global Air Navigation Plan* (Doc 9750) and the ICAO Regional Plans.

8.2.1.4 Spectrum for aeronautical radiocommunication and radionavigation (including surveillance) is allocated by the International Telecommunication Union (ITU) with the recognition of the safety aspects identified above. The ICAO spectrum policy aims at ensuring that aeronautical spectrum capacity requirements are satisfied during the frequency allocation process, taking into consideration the trends in future air traffic management.

8.2.2 Basis for the ICAO spectrum strategy

8.2.2.1 The ICAO spectrum strategy in this chapter has been developed on the basis of current global and regional plans for implementing CNS systems in the period until about 2035. It identifies the spectrum necessary for each of the CNS elements and each relevant frequency band, including specific regional requirements which are part of the overall ICAO spectrum strategy.

8.2.2.2 It consists of a high-level ICAO spectrum strategy (section 8.2.3) and of a set of specific strategy statements for each frequency band (section 8.2.4). The high-level strategy is applicable to all frequency bands, and should be regarded as the basis for the band-by-band strategy statements, and for the relevant ICAO policy statements contained in Section 7-II.

8.2.2.3 In many cases, aeronautical radiocommunication, radiodetermination and radionavigation systems currently in use will continue to operate well beyond 2035, either on a global basis or in certain Regions. The strategy identifies requirements for the medium term as until and beyond 2035. Spectrum requirements identified for the long term indicate that such spectrum is expected to be necessary for an undetermined period, extending to well beyond 2035.

8.2.2.4 The strategy, including the time scale, will be updated on a regular basis taking into consideration developments in the use of current and new CNS systems, as reflected in the *Global Air Navigation Plan* (Doc 9750) Technology Roadmaps.

8.2.3 ICAO high-level spectrum strategy

ICAO HIGH-LEVEL SPECTRUM STRATEGY

- To secure the continuing availability of adequate radio frequency spectrum to support the current and planned aeronautical CNS infrastructure requirements as laid out in the Global Air Navigation Plan and in the Regional Air Navigation Plans.
- To enable the advancement of technological innovation to maintain and enhance the safety of the global air transport system as well as increased efficiency in spectrum utilization.
- To ensure that proposals for new or modified allocations must be supported by sharing studies on the use of frequency bands by aviation and take full account of the possible impact on the aeronautical safety case; these studies need to encompass the total technical, operational and economic aspects of aeronautical system use.
- To conduct ICAO studies on the compatibility of ICAO standard systems with other existing or planned ICAO standard systems.
- To support the ITU studies on the compatibility of ICAO standard systems with non-ICAO standard systems.
- To oppose proposals for new or modified allocations that place undue or unreasonable constraints on the continued use of current aeronautical CNS systems or affect the safety of aviation.
- To support efficient use of the frequency bands allocated to relevant aeronautical services by developing globally harmonized terrestrial-system frequency assignment planning criteria and a global frequency assignment plan in support of the ICAO Global Air Navigation Plan, while recognizing that the actual use of spectrum by aviation may vary between different Regions where different system requirements and corresponding spectrum requirements exist.
- To ensure that aeronautical CNS systems which provide safety-of-life services to aviation operate in frequency bands that are properly allocated for use by aviation, with the objective of operating in spectrum allocated to an appropriate aeronautical safety service, and suitably protected from harmful interference that can be caused by other systems using the same or nearby frequency bands.

8.2.4 ICAO specific band-by-band spectrum strategy for the frequency bands used by civil aviation

ICAO spectrum strategy for aeronautical communication systems (Reference: ICAO Doc 9750, Appendix 5, Roadmaps 1 and 2)			
Frequency band	Aeronautical use	Time scale	ICAO spectrum strategy
2850 – 22000 kHz	HF air/ground communications (voice and data)	Long term	<p>Secure the continuing availability of the HF frequency bands 2850 – 22000 kHz which are allocated to aeronautical mobile (R) service for use by air/ground communications on a global basis.</p> <p><i>Note: Until such time when mobile satellite systems can provide efficient and cost-effective communication services in spectrum that is appropriately allocated for use by aviation, the HF frequency bands will continue to provide the primary means for long distance communications for aviation.</i></p>
108 – 117.975 MHz	GBAS; VDL Mode 4	Long term	<p>Secure the continuing availability of the frequency band 112 – 117.975 MHz (108 – 117.975 for GBAS) which is allocated to the aeronautical mobile (R) service for use by GBAS and VDL Mode 4 on a global basis.</p> <p>Consider, subject to spectrum availability and spectrum requirements, the use of this band to accommodate VHF air/ground communication systems.</p>
117.975 – 137 MHz	VHF air/ground; voice, VDL Mode 2 and VDL Mode 4	Long term	<p>Secure the continuing availability of the frequency band 117.975 – 137 MHz, which is allocated to the aeronautical mobile (R) service, for use by VHF air/ground voice and data link on a global basis.</p>
960 – 1164 MHz	Air/ground UAT LDACS 1090 ES	Long term	<p>Support the implementation of new systems in the aeronautical mobile (R) service in the frequency band 960 – 1164 MHz (LDACS).</p> <p>Secure the continuing availability of the frequency band 960 – 1164 MHz which is allocated to the aeronautical mobile (R) service for use by air/ground and air/air data link systems, by ADS-B via 1090 Extended Squitter and UAT. Implementation of these data links must take place under the express condition that no interference is caused to the aeronautical radionavigation service operating in this frequency band (e.g. DME and SSR).</p>
1545-1555 MHz and 1646.5-1656.5 MHz	Air/ground satellite communications (Inmarsat, MTSAT)	Long term	<p>Support retention of RR No. 5.357A in order to ensure sufficient access on a global basis by the aeronautical mobile satellite (R) service in the bands 1545 – 1555 MHz and 1646.5 – 1656.5 MHz to support the requirements for aeronautical satellite communications.</p> <p><i>Note: In these frequency bands priority access should be provided for aeronautical satellite communications.</i></p> <p>Ensure that any new or existing uses of these frequency bands will not cause harmful interference to the use of the bands by the aeronautical mobile satellite (R) service.</p> <p><i>Note: In the United States in the bands 1555 – 1559 MHz and 1656.5 – 1660.5 MHz the aeronautical mobile satellite (R)</i></p>

ICAO spectrum strategy for aeronautical communication systems (Reference: ICAO Doc 9750, Appendix 5, Roadmaps 1 and 2)			
Frequency band	Aeronautical use	Time scale	ICAO spectrum strategy
			<i>service has priority and immediate access over other mobile-satellite communications within a network.</i>
1610-1626.5 MHz	Air/ground satellite communications (Iridium)	Long term	<p>Support the continuing retention of the allocation to the aeronautical mobile satellite (R) service (E-s, s-E) in the frequency band 1610 – 1626.5 MHz.</p> <p><i>Note: This frequency band has been allocated to the aeronautical mobile satellite (R) service on a primary basis as per footnote 5.367 in the Radio Regulations.</i></p>
3400 – 4200 MHz	VSAT for aeronautical networks and AMS(R)S feeder links	Long term	Support the continuing retention of the allocation to the FSS and adequate protection from other co band and adjacent band services.
5000-5030 MHz 5091-5150 MHz 5030-5091 MHz	AeroMACS UAS terrestrial and satellite C2/C3 communications	Long term	<p>Secure the continuing availability of the frequency band 5091 – 5150 MHz which is allocated to the aeronautical mobile (R) service for use by airport communications (AeroMACS) on a global basis.</p> <p><i>Note: While not in the ITU Radio Regulations, some States may on a National basis allocate the 5000-5030 MHz band to the AM(R)S for use by AeroMACS.</i></p> <p>Secure future implementation of the aeronautical mobile (R) service and the aeronautical mobile satellite (R) service in the frequency band 5030 – 5091 MHz to support air/ground communications for unmanned aircraft systems while satisfying the spectrum requirements for MLS.</p>

ICAO spectrum strategy for aeronautical navigation systems (Reference: ICAO Doc 9750, Appendix 5, Roadmap 5)			
Frequency band	Aeronautical use	Time scale	ICAO spectrum strategy
130-535 kHz	NDB	Global: medium term Regional: long term	Secure the continuing availability of the frequency band 130 – 535 kHz parts of which are allocated to the aeronautical radionavigation service on a global basis for use by NDB systems for at least the medium term and, in the long term, on a Regional basis. <i>Note: Long term use may be required to support national requirements.</i>
74.8-75.2 MHz	Marker beacon	Long term	Secure the continuing availability of the frequency band 74.8 – 75.2 MHz which is allocated to the aeronautical radionavigation service for use by Marker Beacons on a global basis.
108-112 MHz	ILS - Localizer		Secure the continuing availability of the frequency band 108 – 117.975 MHz which is allocated to the aeronautical radionavigation service for use by ILS-Localizer on a global basis.
328.6-335.4 MHz	Glide Path		Secure the continuing availability of the frequency band 328.6 – 335.4 MHz which is allocated to the aeronautical radionavigation service for use by ILS – Glide Path on a global basis.
108-117.975 MHz	VOR	Long term	Secure the continuing availability of the frequency band 108 – 117.975 MHz which is allocated to the aeronautical radionavigation service for use by VOR on a global basis.
960-1215 MHz	DME	Long term	Secure the continuing availability of the frequency band 960 – 1215 MHz, which is allocated to the aeronautical radionavigation service, for use by DME on a global basis term.
1559-1610 MHz	---	---	This band is primarily used to support GNSS systems This band is also allocated to the aeronautical radionavigation service. No strategy has been developed for the future use of this band by the aeronautical radionavigation service.
5030-5091 MHz	MLS	Long term	Secure for the continuing availability of the frequency band 5030 – 5091 MHz which is allocated to the aeronautical radionavigation service for use by the Microwave Landing System (MLS) on a global basis to meet the spectrum requirements for the MLS. Assess, on a Regional basis, requirements for the long term implementation of MLS to establish the spectrum requirements for MLS.

ICAO spectrum strategy for Global Navigation Satellite Svstems (Reference: ICAO Doc 9750, Appendix 5, Roadmap 5)			
Frequency band	Aeronautical use	Time scale	ICAO spectrum strategy
1164-1215 MHz	GNSS	Long term	Secure the continuing availability of the frequency band 1164 – 1215 MHz which is also allocated to the radionavigation satellite service for use by GNSS systems on a global basis, taking into consideration the radio regulatory conditions for using this band.
1559-1610 MHz	GNSS	Long term	<p>Secure the continuing availability of the frequency band 1559 – 1610 MHz which is allocated to the aeronautical radionavigation and the radionavigation satellite services for use by aeronautical GNSS systems, including augmentation systems, on a global basis.</p> <p>Secure deletion of the fixed service from the frequency band 1559 – 1610 MHz and cessation of operation of any station in the fixed service in this band by 1 January 2015.</p> <p>Support the development of regulatory measures to enforce prevention and removal of occurrences of in-band and out-of-band interference.</p>

ICAO spectrum strategy for aeronautical surveillance systems (Reference: ICAO Doc 9750, Appendix 5, Roadmaps 3 and 4)			
Frequency band	Aeronautical use	Time scale	ICAO spectrum strategy
1030 MHz and 1090 MHz	SSR	Long term	Secure the continuing availability of the frequency band 960 – 1215 MHz, which is allocated to the aeronautical radionavigation service, for use by SSR on a global basis.
1215-1350 MHz	Primary surveillance radar	Long term	Secure the continuing availability of the frequency band 1215 – 1350 MHz which is allocated to the radionavigation and aeronautical radionavigation service for use by Primary Surveillance Radar on a global basis.
2700-2900 MHz	Primary surveillance radar	Long term	Secure continuing availability of the frequency band 2700 – 2900 MHz which is allocated to the aeronautical radionavigation service for use by primary surveillance radar on a global basis. Where in adjacent frequency bands mobile systems are in use (e.g. WIMAX and LTE), secure protection of radar stations from harmful interference from mobile systems operating in adjacent bands.
9000-9200 MHz	Primary surveillance radar	Long term	Secure the continuing availability of the frequency band 9000 – 9200 MHz which is allocated to the aeronautical radionavigation service for use by ground based radar systems on a global basis
9300-9500 MHz	Primary surveillance radar	Long term	Secure the continuing availability of the frequency band 9300 – 9500 MHz which is allocated to the aeronautical radionavigation service for use by airborne weather radar and ground based radar on a global basis.
15.4-15.7	Primary surveillance radar	Long term	Secure for the continuing availability of the frequency band 15.4 – 15.7 GHz which is allocated to the aeronautical radionavigation service for use by ground based radar systems on a global basis.
31.8-33.4 GHz	Primary surveillance radar	Long term	Secure the continuing availability of the frequency band 31.8 – 33.4 GHz which is allocated to the radionavigation service and used by primary surveillance radar to support airport surveillance detection equipment (ASDE radar) on a global basis.

ICAO spectrum strategy for aeronautical airborne (stand-alone) [radar] systems			
Frequency band	Aeronautical use	Time scale	ICAO spectrum strategy
4200-4400 MHz	Radio altimeter	Long term	Secure the continuing availability of the frequency band 4200 – 4400 MHz which is allocated to the aeronautical radionavigation service for use by airborne radio altimeters on a global basis.
5350-5470 MHz	Airborne weather radar	Long term	Secure the continuing availability of the frequency band 5350 – 5470 MHz which is allocated to the aeronautical radionavigation service for use by airborne weather radar on a global basis.
8750-8850 MHz	Airborne Doppler and ground mapping radar	Long term	Secure the continuing availability of the frequency band 8750 – 8850 MHz which is allocated to the aeronautical radionavigation service for use by airborne Doppler radar and ground mapping radar on a global basis.
9300-9500 MHz	Airborne weather radar	Long term	Secure the continuing availability of the frequency band 9300 – 9500 MHz which is allocated to the aeronautical radionavigation service for use by airborne weather radar and ground based radar on a global basis.
13.25-13.4 GHz	Airborne Doppler and ground mapping radar	Long term	Secure the continuing availability of the frequency band 13.25 – 13.4 GHz which is allocated to the aeronautical radionavigation service for use by airborne Doppler radar and ground mapping radar on a global basis.

8.3 FUTURE SYSTEMS AND STRATEGY EVOLUTION

8.3.1 Growth in air traffic requires new ways of planning and enhanced ground, airborne, and satellite infrastructure in order to reduce ATM costs, maintain safety, reduce the environmental impact of each flight, and enhance the passenger experience. A process of international discussion and agreement, normally involving a minimum of five years for operational and technical finalization of system parameters followed by an adoption process taking several additional years (as prescribed in the ICAO Convention), is necessary to ensure that any new systems introduced as part of the infrastructure evolution are appropriate and safe. Other aeronautical systems not requiring international agreement to this degree can often be developed and implemented in a shorter timescale, but still require a minimum of several years to reach maturity and acceptance. In all these cases, the actual implementation of these systems requires additional time for implementation (e.g. Regional agreement) in aircraft and on the ground, and a positive business case justifying the commitment of adequate financial resources.

8.3.2 In general, the standardization and the introduction of new systems will have to be consistent with the framework laid out in the *Global Air Navigation Plan* (Doc 9750), and may require updates to one or more of the Technology Roadmaps included in the Plan. This, in turn, may translate into updates to specific elements of the ICAO band-by-band spectrum strategy.

8.3.3 The impact on the ICAO spectrum strategy of the introduction of a new system will depend, *inter alia*, on which of the three following general categories the system falls into with respect to its spectrum requirements:

- a) aviation systems that can be accommodated in existing allocations, with necessary footnote modifications, or less commonly, with modification to the allocation status or description;
- b) aviation systems that require additional spectrum allocations for reasons of compatibility or frequency availability; and
- c) other systems with multi-service application capability whose aviation requirements can be integrated with the other applications, entailing changes to allocation, modification of band limits or footnotes, or less commonly, a completely new allocation.

8.3.4 In any case, the allocation of spectrum for new services and systems in frequency bands already allocated for aeronautical use will have to be consistent with the high level ICAO spectrum strategy and will need to take place within the framework set by the relevant ICAO Standards and Recommended Practices (SARPs) for communication, navigation and surveillance systems, as well as other (industry) Standards that apply to current operational systems.

Note: Requirements for spectrum for meteorological radar and meteorological satellite systems are addressed by the World Meteorological Organization (WMO). However, specific requirements for airborne weather radar systems are included in the ICAO spectrum policy.

8.4 CHALLENGES

8.4.1 For many years aeronautical radio frequency spectrum has been targeted for use by non-aeronautical services, in particular to satisfy requirements for mobile (terrestrial) and mobile satellite communications. This has for example, led to the loss of spectrum that was once allocated exclusively for aeronautical mobile satellite communications (1.5 / 1.6 GHz) and to the introduction of non-aeronautical services in bands previously allocated for aeronautical use on an exclusive basis (e.g. the fixed satellite

service in the frequency band 5091 – 5250 MHz, the non-safety aeronautical mobile service for telemetry in the frequency band 5091 – 5150 MHz and the radionavigation satellite service in the frequency band 5000 – 5030 MHz). This has created the potential of interference and / or loss of spectrum capacity to satisfy current and future aeronautical requirements for CNS system.

8.4.2 There is currently pressure to release significant amounts of spectrum to support future commercial mobile communications and broadband wireless applications. Between 500 and 1200 MHz of bandwidth is being sought, mainly in the range from 300 MHz to 6 GHz. This range includes frequency bands used by a large number of safety critical aeronautical systems, including Instrument Landing System (ILS) glide-path, Distance Measuring System (DME), Primary and Secondary Radar, Airborne Collision Avoidance System (TCAS), AMS(R)S, VSAT aeronautical networks and Radio Altimeters.

8.4.4 Another new element that may affect the future availability of radio frequency spectrum for aviation is the possible introduction of “Spectrum Pricing” which may have a significant economic impact on the aviation industry as a whole.

8.4.5 The ICAO spectrum strategy recognizes the challenges outlined above and provides the framework within which ICAO develops the international civil aviation ICAO Position on issues of interest to international civil aviation to be decided at ITU World Radiocommunication Conferences, which are the fora where these challenges typically face aviation.