



International Civil Aviation Organization

FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

THIRD MEETING

Virtual Meeting, 7 September 2022

REPORT FOLDER

The material in this report has not been considered by the Air Navigation Commission. The views expressed therein should be taken as advice of a panel of experts to the Air Navigation Commission but not as representing the views of the Organization. After the Air Navigation Commission has reviewed this report, a supplement setting forth the action taken by the Air Navigation Commission thereon will be issued to this report.



FSMP/3-WP/03
2022-09-07

FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

THIRD MEETING

Virtual Meeting, 7 September 2022

GENERAL

The attached constitutes the general part of the report and should be inserted at the appropriate place in the yellow folder.

**THIRD MEETING OF THE
FREQUENCY SPECTRUM MANAGEMENT PANEL
(FSMP/3, 7 September 2022)**

LETTER OF TRANSMITTAL

To: President, Air Navigation Commission

From: Chairman, Frequency Spectrum Management Panel
(FSMP) (2022)

I have the honour to submit the report of the third meeting of the Frequency Spectrum Management Panel (FSMP) which was held virtually, on 7 September 2022.

A handwritten signature in black ink, appearing to read 'A. Roy', is placed on a light grey rectangular background.

Andrew Roy
Chairman

7 October 2022

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FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

THIRD MEETING

Virtual Meeting, 7 September 2022

HISTORY OF THE MEETING

1. DURATION

1.1 The duration of the third meeting of the Frequency Spectrum Management Panel (FSMP) was one day, 7 September 2022, while leveraging in part the work performed during the meeting of FSMP-WG/15 (22 August – 1 September 2022). The meeting was opened by Mr. Padhraic Kelleher, President of the Air Navigation Commission, at 0700 hours on 7 September 2022.

2. ATTENDANCE

2.1 The meeting was attended by members and observers nominated by eleven Contracting States and six international organizations, as well as by advisers and others as shown in the list below :

Members	Advisers	Nominated By
KELLY, Matthew		Australia
	ANTOINE YAGHDJIAN, Vahe,	Brazil
ZHAO, Liang	CUI, Kaitao LIU, Rui	China, (People’s Republic of)
FLEURY, Christian	ANDRE, Jerome	France
BUTSCH, Felix	WEBER, Martin WOERFEL, René WINTER, Stefan BEITZ, Christian BOVELLI, Sergio	Germany
ARAKAWA, Katsuyuki	SAEKI, Yoshiaki ONO, Fumie NOMI, Toshio YONEMOTO, Naruto TSUJI, Hiroyuki FUTATSUMORI, Shunichi TANG, Furen WADA, Takayuki TSUKADA, Hiroki	Japan

TELE, Cokisa Lisa		South Africa
METTROP, John	MASRANI, Kamlesh PARRY, Stephen	United Kingdom
BIGGS, Michael	TOURIGNY, Chris	United States
ROY, Andrew	HUTCHISON, Kris SHROUT, Nic	ASRI
KHATCHERIAN, Raffi	MICALLEF, John	EUROCONTROL
PRINGVANICH, Noppadol		IATA
CRAMER, Joseph	PICHAVANT, Claude	ICCAIA
VASSILIEV, Nikolai	BOGENS, Karlis	ITU

Observers

AZIZ, Abdul BIMANTORO	Indonesia
CALINCIUC, Aurelian Sorinel	Romania
GARCIA MARTIN, Manuel	Spain

ICAO Secretariat

JÓNASSON, Loftur

3. OFFICERS AND SECRETARIAT

3.1 Mr. Andrew Roy (ASRI) and Mr. Christian Fleury (France), were elected as Chair and Vice-Chair of the Panel for a duration of three years and acted as Chair and Vice-Chair for the meeting.

3.2 Mr. Loftur Jónasson, Chief - CNS and Spectrum (CNSS) Section of the Air Navigation Bureau, acted as Secretary for the meeting.

4. AGENDA OF THE MEETING

4.1 The agenda for the meeting shown hereunder was approved by the Air Navigation Commission on 20 July 2022.

Agenda Item 1: Election of Chairman and Vice-Chairman

Agenda Item 2: Adoption of the Provisional Agenda

- 2.1 Opening
- 2.2 Meeting arrangements

Agenda Item 3: Brief Status Report from FSMP WG/15:

- 3.1 Report on WRC-23 position updates
- 3.2 Report on the status of development of SARPs describing the radio frequency and interference rejection characteristics for Radio Altimeters
(*Ref: Job card FSMP/006.01*)
- 3.3 Report and proposals for updates of Job Cards

Agenda Item 4: Endorsement of proposal of amendments

- 4.1 SARPs and guidance to prevent interference between Wireless Avionics Intra-Communication Systems and Radio Altimeters
(*Ref: Job card FSMP/007.01*)

Agenda Item 5: Review and update of existing job cards and development of new Job cards

Agenda Item 6: Future work programme of the FSMP

Agenda Item 7: Any other business

5. WORKING ARRANGEMENTS

5.1 The panel met as a single body. Discussions in the main meeting were conducted in English. Working documentation was presented in English only. The report was issued in English.

6. OPENING REMARKS

6.1 Opening remarks by the President of the Air Navigation Commission

6.1.1 Mr. Padhraic Kelleher, the President of the Air Navigation Commission (ANC), addressed the meeting and welcomed participants. Mr. Kelleher thanked Mr. Michael Biggs, the recently retired Chairman of the Panel for his efforts and leadership and welcomed the new Chairman and Vice-Chair, Mr Andrew Roy and Mr. Christian Fleury. Mr. Kelleher noted the determination of the Panel to keep the work going during the most difficult of times, especially noting the busy agenda for aviation ahead of the ITU World Radiocommunication Conference in 2023. He noted especially the requirement for aviation continually having to prove that it remains a good spectrum citizen and saluted the Panel for carrying that message forward, also expressing hope that the work of the ICNSS Task Force will be of assistance in scoping the work forward. He expressed specific interest in learning the Panel's views on the topic of radio altimeter interference from 5G.

6.2 Opening remarks by the Director of the Air Navigation Bureau

6.2.1 Mr. Stephen Creamer, Director of the Air Navigation Bureau, provided opening remarks on behalf of the ICAO Secretariat. He especially noted the model that the FSMP has been a core contributor to, to build the ICAO relationship with ITU and the World Radiocommunication Conference process, a model which the ICAO Secretariat has come to appreciate, especially during the last three years as the world has been battling the pandemic. The strong relationship that FSMP has developed with the regulatory community for spectrum is an example ICAO is now looking to build on in the arena of public health. As became so clear in March of 2020, aviation has to follow the regulations of the public health authorities, who generally coalesce their work within the World Health Organization (WHO). The relationship between ICAO and WHO is now being built and strengthened along the lines that has become so successful between ICAO and the ITU, the core of that work being done within the FSMP.

6.3 The meeting expressed appreciation for the comments made by the President of the Air Navigation Commission and the Director of the Air Navigation Bureau.

 7. **LIST OF RECOMMENDATIONS***
RSPP | Recommendation 4/1 — Amendment to Annex 10-Aeronautical Telecommunications, Volume V – Aeronautical Radio Frequency Spectrum Utilization, relating to the introduction of the newly developed WAIC SARPs

That the proposed amendment, as shown in the Appendix to agenda item 4, be submitted to the ANC for an amendment proposal to Annex 10, Volume V.

Recommendation 5/1 Amend Job-Card FSMP.001.01

That this Job Card be amended as shown in the Appendix to the report on this agenda item, adding the new Annex 10 Vol VI as a reference document and adding the RPASP and ICNSS-TF as supporting expert groups. Dates are updated to reflect timely output for the ITU World Radiocommunication Conference in 2027 (WRC-27).

Recommendation 5/2 Amend Job-Card FSMP.002.01

That this Job Card be amended as shown in the Appendix to the report on this agenda item. Slight editorial updates are being proposed and the dates are updated to reflect timely output for the next ITU World Radiocommunication Conference (WRC-23)

Recommendation 5/3 Amend Job-Card FSMP.003.01

That this Job Card be amended as shown in the Appendix to the report on this agenda item, adding the new Annex 10 Vol VI as a reference document and adding two supporting expert groups, the ICNSS-TF to reflect spectrum-use improvement actions and the FLTOPSP to reflect support to actions such as facilitating protection of frequency spectrum for Enhanced Flight Vision Systems. Dates are updated to reflect timely output for the ITU World Radiocommunication Conference in 2027 (WRC-27).

Recommendation 5/4 Amend Job-Card FSMP.004.02

That this Job Card be amended as shown in the Appendix to the report on this agenda item, to reflect timely output for the ITU World Radiocommunication Conference in 2027 (WRC-27).

* Recommendations annotated “RSPP” relate to proposals for amendment of Standards, Recommended Practices and Procedures for Air Navigation Services or guidance material in an Annex.

Recommendation 5/5 Amend Job-Card FSMP.005.02

That this Job Card be amended as shown in the Appendix to the report on this agenda item, adding the new Annex 10 Vol VI as a reference document. Reflecting support to work on-going in other CNS related Panels (SP, CP, NSP and RPASP), description has been amended and those panels added as Supporting Expert Groups. Dates are updated to reflect timely output for the ITU World Radiocommunication Conference in 2027 (WRC-27).

Recommendation 5/6 Amend Job-Card FSMP.006.01

That this Job Card be amended as shown in the Appendix to the report on this agenda item. The “Document Affected” column has been modified to indicate Annex 10 Volume V as the intended target for the deliverable and the on-going work developing radio altimeter (RA) guidance within EUROCAE and RTCA is being reflected. The Action field has been superseded by the on-going RA/5G mitigations. Given the current progress of work within EUROCAE and RTCA it is envisioned that the RA SARPs deliverable out of FSMP will be finalized by 2025.

Recommendation 5/7 Amend Job-Card FSMP.007.01

That this Job Card be amended as shown in the Appendix to the report on this agenda item. Noting the agreed new WAIC SARPs deliverable, the Job-Card FSMP.007.01 was touched to reflect the deliverable being envisaged for Annex 10 Volume V and to indicate the envisaged effective and applicability dates of the new SARPs.



FSMP/3-WP/03
2022-09-07

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AGENDA ITEM 1

The attached constitutes the report on Agenda Item 1 and should be inserted at the appropriate place in the yellow folder.

Agenda Item 1: Election of Chairman and Vice-Chairman

1.1 The meeting elected Mr. Andrew Roy (ASRI) and Mr. Christian Fleury (France) as the Chairman and Vice-Chairman of the Panel. The meeting expressed its appreciation for the out-going Chairman, Mr. Michael Biggs, who had served in that role since FSMP/1, in 2015.



FSMP/3-WP/03
2022-09-07

FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

THIRD MEETING

Virtual Meeting, 7 September 2022

AGENDA ITEM 2

The attached constitutes the report on Agenda Item 2 and should be inserted at the appropriate place in the yellow folder.

Agenda Item 2: Opening and approval of the Agenda

2.1 The third meeting of the Frequency Spectrum Management Panel was held between 0600 and 1200 hours (EST) on 7 September 2022. The first hour (0600 – 0700) was a closed meeting for nominated Panel members only, to elect a new Chairman and Vice-Chairman. (Ref: WP/03, Agenda Item 1). The meeting was held virtually using the Zoom videoconferencing application.

2.2 The agenda for the meeting, as approved by the Air Navigation Commission and transmitted to FSMP members on 2 August 2022 was approved (Ref: ii-History of Meeting, sub-para 4, Agenda of Meeting). This being a one-day meeting and held in a virtual setting, it focussed on a limited agenda, namely the updates of FSMP Job Cards and approval of draft SARPs.



FSMP/3-WP/03
2022-09-07

FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

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AGENDA ITEM 3

The attached constitutes the report on Agenda Item 3 and should be inserted at the appropriate place in the yellow folder.

Agenda Item 3: Brief Status Report from FSMP WG/15

- 3.1 A draft Report of FSMP WG/15 was submitted and presented to the meeting.
- 3.2 The 15th meeting of FSMP WG/15 was held in a hybrid format, the physical portion held at the IATA offices in Montreal. Appreciation was expressed for the excellent facilities made available by IATA for this meeting. The meeting was chaired by Mr. Michael Biggs, the outgoing Chairman of FSMP. In total there were 99 meeting participants, thereof 29 people attending in-person.
- 3.3 The main topics of the meeting included the WAIC SARPs, to look at some formatting changes resulting from the review by FSMP WG/14; updates to the ICAO Position for WRC-23; development of input material to ITU-R studies supporting the WRC; Radio Altimeter (RA) and 5G issues; and a brief look at the FSMP Job Cards, the goal being to support the discussion of those during FSMP/3.
- 3.3.1 A number of draft updates to the ICAO Position for WRC-23 were agreed, reflecting the progress of the on-going studies within ITU-R and ICAO, while there are still some outstanding issues that need further discussion. The updates to the ICAO Position will be finalized by FSMP WG/16, scheduled for Q1 2023.
- 3.3.2 Material was developed to support ICAO contributions to ITU-R studies on current WRC issues. Material for three external liaisons, including two to ITU, was developed and agreed.
- 3.3.3 A discussion was held on Radio Altimeters (RA) and 5G, mainly focussing on recent 5G interference measurements performed in Japan (FSMP WG/15 IP/03) and a very good summary of studies and approaches put together by the ICAO MID office (FSMP WG/15 IP/09). An update to the report from the Correspondence Group on the RA issue was reviewed (FSMP WG/15 IP/08). This report includes a compilation of the work being performed to date in different States, addressing the RA and 5G issue and the various mitigation strategies taken. No reports of interference from 5G installations to RA have been received to-date. This confirms that States are following the guidance on operational-workarounds devised thus far.
- 3.4 It was reported that FSMP WG/15 had elected a new Rapporteur and Vice-Rapporteur for the FSMP-WG, Mr. Andrew Roy (ASRI) and Mr. Christian Fleury (DGAC/DSNA). Mr. Michael Biggs expressed his confidence in this team, that they will do a great job in keeping the ball rolling.
- 3.5 The draft report of FSMP WG/15 was approved as the finalized report of that meeting and is attached to the report of FSMP/3 as an Appendix.

Appendix to the Report of FSMP/3: Report of FSMP WG/15, held 22 August – 1 September 2022



FSMP/3-WP/03
2022-09-07

FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

THIRD MEETING

Virtual Meeting, 7 September 2022

AGENDA ITEM 4

The attached constitutes the report on Agenda Item 4 and should be inserted at the appropriate place in the yellow folder.

Agenda Item 4: Endorsement of proposal of amendments

4.1 A set of draft new SARPs for Wireless Avionics Intra-Communications (WAIC) as endorsed by FSMP WG/15 were presented to FSMP/3.

4.2 WAIC is a new class of wireless data links intended for communications between various safety-of-flight related functions on-board a single aircraft. A new aeronautical mobile route service allocation for WAIC, co-using the frequency band 4 200 – 4 400 MHz with the aeronautical Radio Altimeters which also operate in this band, was established by the World Radiocommunication Conference in 2015 (WRC-15), thus facilitating the efficient use of this frequency band.

4.2 FSMP WG/15 performed a final review of the draft new WAIC SARPs package and agreed to endorse the draft SARPs to FSMP for approval. Prior to FSMP WG/15, the Secretariat had undertaken an editorial review of the draft new WAIC SARPs package. The draft SARPs were originally written for insertion into Annex 10 Vol III, however considering that these draft new SARPs focus on spectrum sharing and compatibility rather than system inter-operability, the previous meeting of FSMP WG (FSMP-WG/14) had agreed that the SARPs would be a better fit for Annex 10 Volume V.

4.3 FSMP/3 agreed with the approach taken, to insert into Annex 10 Volume V, Chapter 4, a new section 4.5, to reflect utilization in the frequency band 4 200 – 4 400 MHz. It was noted that the draft new Radio Altimeter SARPs currently under development (Ref: Job Card FSMP.006.01) would also be inserted under that same new section. Consequently, FSMP/3 approved the draft SARPs as contained in Annex 1 to the Attachment hereto and agreed to the following recommendation:

RECOMMENDATION:

RSPP	Recommendation 4/1 — Amendment to Annex 10-Aeronautical Telecommunications, Volume V – Aeronautical Radio Frequency Spectrum Utilization, relating to the introduction of the newly developed WAIC SARPs
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That the proposed amendment, as shown in the Appendix to agenda item 4, be submitted to the ANC for an amendment proposal to Annex 10, Volume V.
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ATTACHMENT:

- Annex 1:** Proposed Modifications to Annex 10 Volume V to the Convention on International Civil Aviation
- Annex 2:** Impact and Implementation Assessment
- Annex 3:** Validation Statement

ATTACHMENT (including Annexes 1 to 3)

ANNEX 1

Proposed Modifications to Annex 10 Volume V to the Convention on International Civil Aviation

Insert new text as follows

CHAPTER 1. DEFINITIONS

...

Wireless Avionics Intra-Communications (WAIC) – Radiocommunication between two or more aircraft stations located on board a single aircraft for aircraft applications related to the safety and regularity of flight using the aeronautical mobile (route) service (AM(R)S) allocation in the frequency band 4 200 – 4 400 MHz; supporting the safe operation of the aircraft.

WAIC System – A system which provides wireless communications between points on board a single aircraft. A WAIC System may be comprised of one or more WAIC Networks necessary for establishing, maintaining and securing wireless communications. A WAIC System is understood as the entirety of all WAIC components on board the same aircraft, so that a single aircraft contains only a single WAIC System.

WAIC Network – A network comprising of interrelated WAIC Components, e.g., components used for wireless communications, security or network management.

WAIC Component – Any tangible entity of a WAIC Network on board an aircraft.

WAIC Node – A specific category of a WAIC Component establishing wireless communications between aircraft applications or parts thereof.

Origin: FSMP	Rationale: The above definitions are specific to WAIC and are being added to the definitions in Chapter 1 of Annex 10 Volume V.
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CHAPTER 4. UTILIZATION OF FREQUENCIES ABOVE 30 MHz

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4.5 UTILIZATION IN THE FREQUENCY BAND 4 200 – 4 400 MHz

4.5.1 Utilization for Radio Altimeters

To be developed

[Editorial Note: This placeholder refers to the Radio Altimeter SARPs currently under development. This is a similar approach to the one agreed by ANC for Annex 10 Vol VI, indicating a placeholder for material currently under development and expected to be delivered at a later date. This TBD refers to the work performed under Job Card FSMP.006.01]

4.5.2 Utilization for Wireless Avionics Intra-communication (WAIC) systems

Note: The below provisions for WAIC define the requirements that ensure that WAIC Systems and radio altimeters can provide their intended functions while multiple aircraft are in mutual radio range. Coexistence between WAIC Systems and radio altimeters installed on board the same aircraft is addressed by the specific implementation and established airworthiness certification processes.

4.5.2.2 WAIC Systems shall comply with the applicable provisions of the Radio Regulations.

4.5.2.3 WAIC shall only be used for communications related to the safety and regularity of flight, between two or more points on a single aircraft.

4.5.2.4 WAIC Systems shall not cause harmful interference to radio altimeter systems and WAIC systems on other aircraft.

Note: Compliance with [4.5.2.4](#) is achieved by limiting the power of WAIC emissions below the level at which altimeter performance may be affected, consistent with 4.5.2.6 below. EUROCAE/RTCA documents ED-260A/DO-378A provide one acceptable method of demonstrating compliance with that power limit.

4.5.2.5 A WAIC system located on board one aircraft shall maintain its intended function while subject to emissions from WAIC and radio altimeter systems located on board other aircraft.

Note: EUROCAE/RTCA documents ED-260A/DO-378A provide one acceptable method of demonstrating compliance with [4.5.2.5](#) via test. Alternatively, the critical coexistence scenario described in those documents may also be used to develop appropriate analyses to demonstrate compliance with [4.5.2.5](#).

4.5.2.6 Radio frequency (RF) characteristics of WAIC systems

4.5.2.6.1 WAIC systems shall operate in the frequency band 4 200 – 4 400 MHz.

4.5.2.6.2 The power of the total aggregate emissions of all WAIC transmitters on board an aircraft shall not exceed an equivalent isotropic radiated power of -20dBm, assuming a point source located at the geometrical center of the aircraft.

4.5.2.6.3 The overall occupied bandwidth shall be maintained completely within the allocated frequency band 4 200 – 4 400 MHz including any offsets such as Doppler shift or frequency tolerances. Where the occupied bandwidth is defined as the bandwidth for which 99% of the signal energy falls within the lower and upper frequency limits.

Note: The Radio Regulations define the occupied bandwidth as “The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage $\beta/2$ of the total mean power of a given emission”. The value of $\beta/2$ being 0.5%.

4.5.2.6.4 The necessary bandwidth (NB) of the WAIC transmitter shall be calculated according to Appendix 1 of the Radio Regulations.

4.5.2.6.5 The boundary between the out-of-band and spurious domains shall be determined according to Annex 1 of Appendix 3 of the Radio Regulations. The required attenuation of the mean power of any unwanted emission relative to the total mean power P shall meet or exceed the following conditions:

50% of NB $< f <$ 150% of NB: Linear increase (in dB) from 24dB to 35dB within a reference bandwidth of 4kHz (Note 1)

150% of NB $< f <$ start of the spurious domain: 35dB within a reference bandwidth of 4kHz (Note 1)

Spurious domain: $56+10\log(P)$ or 40dB whichever is less stringent measured in a RBW of 1MHz (Note 2)

Note 1: Reference bandwidth of 4 kHz within the out-of-band domain in accordance with Annex 11 of Recommendation ITU-R SM.1541-6. The parameter f is the frequency separation from the center frequency of the transmit signal.

Note 2: Reference bandwidth of 1 MHz within the spurious domain in accordance with Appendix 3 paragraph 7 of the Radio Regulations and determination of attenuation for low power device radio equipment in accordance Appendix 3 paragraph 13 of the Radio Regulations.

4.5.2.7 Out-of-Band Interference Tolerance of a WAIC Receiver

Note: These requirements are for WAIC equipment and define an RF environment in which WAIC equipment must meet its performance requirements without taking into account any mitigation afforded by its installation.

4.5.2.7.1 Receivers shall tolerate interference from sources operating outside of the frequency band 4 200 - 4 400 MHz whose total combined emitted power falling within the frequency band 4 200 - 4 400 MHz as measured at the receiver does not exceed a power spectral density of -120 dBm / MHz.

4.5.2.7.2 Receivers shall tolerate interference from sources operating outside of the frequency band 4 200 – 4 400 MHz whose total combined power as measured at the receiver does not exceed -20 dBm.

<p>Origin: FSMP</p>	<p>Rationale: In order to ensure safe operation, the sections above describe the purpose, basic functions and minimum RF characteristics of the WAIC transmitter and the WAIC</p>
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	receiver, necessary to prevent interference between a WAIC system onboard one aircraft and radio altimeters onboard other aircraft. No guidance is required to ensure coexistence of WAIC systems onboard multiple aircraft.
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ANNEX 2

**Impact and Implementation Assessment
Proposed Text to be Submitted to ANC**

PART 1: IMPACT ASSESSMENT

1.1 What is the problem/opportunity that this proposal is designed to address?

Please include reference to Jobcard / ASBU / work programme item, as applicable
(Reference: Job Card FSMP 07.01 – Develop and maintain SARPs and guidance to prevent WAIC / Radio Altimeter interference)

Resolution 424 of the World Radiocommunication Conference 2015 established a new aeronautical mobile route service allocation in the frequency band 4200 – 4400 MHz, reserved exclusively for Wireless Avionics Intra Communications (WAIC), and invited ICAO to develop SARPs for WAIC taking into account Recommendation ITU-R M.2085. As specified in Resolution 424, WAIC cannot cause harmful interference to, nor claim protection from radio altimeters operating in the same band as part of the pre-existing frequency allocation to the aeronautical radionavigation service. These proposed SARPs specify conditions that will assure such safe coexistence between future WAIC installations and radio altimeters.

WAIC is a new type of wireless on-board communication serving aircraft functions related to safety and regularity of flight. To-date, wireless data links have been feasible only for non-critical and non-essential aircraft functions. Availability of a new route allocation for WAIC will allow the use of wireless links for a wide range of aircraft systems. Possible applications of WAIC, as discussed in detail in Report ITU-R M.2283, include a variety of sensing, monitoring and control functions. The ability to deploy new sensors without additional wiring will allow introduction of new sensing and monitoring capabilities, leading to increased safety and efficiency of flight. Dissimilar redundant wireless links will make it easier to design safety critical systems by reducing common failure modes in data links. Aircraft reconfiguration and retrofit will be made more efficient when fewer wired data links have to be physically rerouted. Reduction of wire weight will also be consistent with ICAO environmental contributions to Sustainable Development Goals. Other, not yet fully understood benefits of WAIC will likely become apparent once the technology becomes commercially available.

In order to realize the many potential benefits of WAIC, ICAO needs to develop and approve SARPs. Per Resolution 424 (WRC-15) WAIC can operate only in compliance with ICAO SARPs. In order to fully invest in technical development of WAIC, the industry must have a high level of certainty about technical requirements that WAIC equipment and networks must satisfy. Therefore, the approval of these SARPs will be a crucial and necessary step towards practical deployment of WAIC systems.

1.2 What is the overall impact of this proposal on the strategic objectives of ICAO, namely:

	Positive / Negative / Negligible/None	Rationale: <i>Please provide an explanation for your choice and highlight any caveats or limitations in the selection</i>
Safety	Positive	WAIC is an enabling technology introducing a new communications medium between aircraft functions. WAIC will enable expanded intra-system communications and the introduction of new sensors/actuators. WAIC-related safety impacts can only be assessed in association with future intended functions. The current level of safety will be at least maintained. Depending on the actual function WAIC is used for, safety may be improved for particular circumstances, e.g., by allowing dissimilar redundancy or adding new safety functionalities.
Security	Negligible/None	WAIC Systems do not provide communication between two aircraft. Specific equipment security capabilities and system implementations are defined in the WAIC MOPS to protect systems against specific threats.
Environment	Positive	Enhanced sensing, without additional weight penalty of new wiring, will enable more energy-efficient operation of aircraft systems, thus reducing the overall fuel consumption and carbon emissions.

Efficiency	Positive	Reduction of wiring, with associated harnesses and connectors, will simplify the design effort needed to add and route new wiring, and will reduce assembly and installation labor. New sensing and monitoring functions made possible by WAIC will facilitate predictive and condition-based maintenance, reducing gate delays and improving air transport efficiency.
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1.

Note: In the following questions ‘States’ applies to the adoption and oversight of new SARPs. ‘Industry’ applies to the service provision and use, whether State owned or not (e.g., ANSPs, airlines aerodromes, meteorology, general aviation, etc.). With respect to financial costs for States, it refers to the cost to develop, implement, maintain, and consider oversight issues associated with the proposed change. For Industry, it refers to the cost of implementing the change, where compliance is required by the State, which may translate in costs for equipment, human resources, training, documentation, aircraft modifications or upgrades, operations and airworthiness for example.

1.3 What is the overall impact on resources (financial, personnel, etc.) of this proposal for:

	Increase/decrease/negligible/ unknown	Rationale: <i>Please provide an explanation for your choice and highlight any caveats or limitations in the selection</i>
States	Negligible/No impact	No changes to existing systems or infrastructure will be needed when WAIC Systems are introduced. WAIC involves communication only between points on a single aircraft, and does not require any new infrastructure.
Industry	Negligible/No impact	The proposed WAIC Systems will be implemented on new aircraft being delivered from the aircraft manufacturers and also potentially on retrofit aircraft, with no impact on other aircraft that does not use WAIC.

1.4 In your opinion, do the benefits of this proposal justify the cost of implementing the proposal from the perspective of:

	Answer	Rationale: <i>Please provide an explanation for your choice and highlight any caveats or limitations in the selection</i>
States	Yes	WAIC will allow design of more efficient and intelligent aircraft systems with enhanced sensing and monitoring functionalities, facilitating technical progress in aviation and improving efficiency of air travel.
Industry	Yes	The new AM(R)S allocation for WAIC was established due to industry request. The availability of SARPs for WAIC will allow taking advantage of the many potential benefits of WAIC.

2.

PART 2: IMPLEMENTATION PLAN

To assist ICAO and States ensure this proposal will be effectively implemented please answer the following questions.

Note: The ANC recognizes that panel experts may feel limited in their ability to answer some or all of these questions, however, encourages the panels to provide their views. If still unsure, it is acceptable to leave one or more blank. The answers presented to the ICAO Council with the proposed amendment will be further developed by ICAO.

2.1 What supporting documentation is required for this proposed amendment?

Please include reference to any documents that require initial release/amendment e.g., ICAO Document or Circular name and number, industry specification, etc.

- Supporting material in Doc 9718 Vol I.
- EUROCAE/RTCA documents ED-260A/DO-378A.

2.2 What other guidance, training and support activities do you recommend ICAO undertake to ensure the effective implementation of this proposed amendment?

Please include reference to any existing support/promotional programmes and whether it is required globally or regionally e.g., regional seminars, ikits, etc.

- Awareness of new SARPS provided through Regional Spectrum and WRC preparatory workshops.

2.3 What are the essential steps to be followed by a State in order to implement this proposed amendment?

Please include the major steps e.g., amendment of national legislation, change of oversight procedures, training of oversight personnel, required competencies, etc.

- National radio frequency spectrum regulations need to be adapted to reflect the changes in the Radio Regulations for WAIC agreed by WRC-15 for WAIC.

2.4 What is the timeframe needed to implement this proposal by:

	Answer	Rationale: <i>For the State, the timeframe is the length of time needed to implement in the national regulatory framework For industry, the timeframe is the length of time needed for industry to start implementing in their operations</i>
States	1 - 2 Years	National radio frequency spectrum regulations need to be adapted to reflect the changes in the Radio Regulations for WAIC agreed by WRC-15 for WAIC.
Industry	1 - 2 Years	The lack of SARPs is the main factor preventing the industry from developing and deploying WAIC solutions. Once these SARPs are approved, the expectation within the industry is to have first WAIC solutions available within 2 years.

PART 3: AUDIT PLAN

Note: This section will be completed by ICAO prior to the presentation of any proposed changes to SARPs or PANS. The Panel Secretary will coordinate with the relevant experts in ICAO.

3.1 Does this proposal require an amendment of the USOAP CMA protocol questions to assess effective implementation by States?

Please include reference to existing PQs that may need amendment or description of any new PQs that may be required. State 'Not applicable' if no impact

- No changes are envisaged in the protocol questions.

ANNEX 3

Validation Statement Proposed Text to be Submitted to ANC

WAIC SARPS VALIDATION REPORT

1. INTRODUCTION

1.1. Wireless Avionics Intra-Communications (WAIC) is a new class of wireless data links intended for communication between various functions on-board a single aircraft. A new aeronautical mobile route service allocation for WAIC within the radio frequency band of 4 200 – 4 400 MHz was established by the 2015 World Radiocommunication Conference (WRC-15).

1.2. The same radio frequency band includes an aeronautical radionavigation service allocation reserved for radio altimeters. The new allocation for WAIC requires that WAIC cannot cause harmful interference to nor claim protection from radio altimeters. Therefore, in development of SARPs for WAIC the main technical task was to establish and validate conditions under which WAIC shall not harmfully interfere with altimeters.

1.3. This report summarizes studies that were undertaken to characterize susceptibility of radio altimeters with respect to interference from WAIC and to validate technical requirements to be included in WAIC SARPs. The particular technical parameter under consideration was the total radiated power emitted from a WAIC system on board a single aircraft. A series of experimental studies investigated the highest power that may be emitted from a WAIC-equipped aircraft that allows normal operation of altimeters on other aircraft. Results of those studies were presented to and analyzed by FSMP.

1.4. Prior to finalization of these SARPs, the EUROCAE Working Group 96 and RTCA Special Committee 236 jointly developed a Minimum Aviation System Performance Standard (MASPS) for WAIC, which is now published as ED-260A and DO-378A. That joint committee reviewed the same experimental study and confirmed its validity. The technical specifications in WAIC SARPs are consistent with conditions specified within this WAIC MASPS.

2. WAIC POWER LIMIT

2.1. Resolution 424 (WRC-15) invited ICAO to take into account Recommendation ITU-R M.2085 “*Technical conditions for the use of wireless avionics intra-communication systems operating in the aeronautical mobile (R) service in the frequency band 4 200 – 4 400 MHz*” when developing WAIC SARPs. That Recommendation specifies that the maximum equivalent isotropically radiated power (EIRP) spectral density generated by a WAIC system installed on board a single aircraft must not exceed 6 dBm/MHz, or equivalently 4mW/MHz. The WAIC SARPs recommends that the power of the total emissions of all WAIC transmitters on board an aircraft shall not exceed an equivalent isotropic radiated power of -20dBm assuming a point source located at the geometrical center of the aircraft, which complies with the limit in Recommendation ITU-R M.2085.

2.2. ED-260A and DO-378A “MASPS for Coexistence of Wireless Avionics Intra-Communication Systems within 4 200-4 400 MHz” adopt the total EIRP limit for WAIC systems and provide a practical verification procedure how to ascertain whether the limit is satisfied.

2.3. The validation study summarized herein took as the basis the power limit from ITU-R M.2085. The goal was to confirm experimentally whether that limit assures safe operation of actual radio altimeter implementations aboard other aircraft under worst case operational scenarios. Thus, the much lower limit provide by the WAIC SARPs will provide an even greater margin to prevent interference.

3. INTERFERENCE SUSCEPTIBILITY STUDY

3.1. The experimental study was performed by the Aerospace Vehicle Systems Institute (AVSI). The project team included three leading altimeter manufacturers (Honeywell, Rockwell Collins, Thales), two airframers (Airbus, Embraer), as well as equipment manufacturers (Lufthansa Technik, UTC, Zodiac) and NASA specialists.

3.2. The study was performed at Texas A&M University to enable objective and repeatable testing in an independent academic setting.

3.3. A collection of commercial altimeters was placed within a calibrated test bench. Controlled interference signals were injected into altimeter receivers’ additive to their return signals.

3.4. Through analysis and experimental iteration, the project team established the worst-case operational scenario under which multiple WAIC-equipped aircraft generate most severe interference received by altimeters on a victim aircraft. That worst-case scenario involves landing when the multiple WAIC-aircraft aircraft parked or taxiing at the airport, consistent with ICAO regulations for aerodromes, generate the most severe composite interference environment.

3.5. The study crucially considered interference from multiple altimeters installed on multiple aircraft at the airport, as well as from multiple redundant altimeters aboard the landing (victim) aircraft. That was a primary concern for FSMP, as other altimeters represent the most severe interference source for a victim altimeter, often exceeding the effects of potential interference from WAIC.

3.6. The study used a set of very conservative assumptions and was thoroughly reviewed by the altimeter experts on the AVSI team. It was also reviewed and accepted by a wider team on the joint WG-96 and SC-236 committee, including experts from EASA and FAA.

3.7. Details of the study were reviewed by FSMP in form of a series of Information Papers submitted by AVSI.

4. VALIDATION OF REMAINING SARPS REQUIREMENTS

4.1. Additional parameters specified by this SARPs were experimentally found to have no effect on the interference sensitivity of radio altimeters. However, to properly implement WAIC systems, these additional parameters are required to meet international radio frequency spectrum regulation and have been verified by FSMP members as sufficient to satisfy these regulations.

4.2. Specifically, the unwanted emissions limits were thoroughly discussed to assure compliance with applicable ITU-R recommendations and national regulations. The final version of the emissions mask

satisfies all the requirements introduced by FSMP members representing different national regulatory bodies.

4.3. Out-of-band interference tolerance was similarly thoroughly examined discussed to assure compliance with applicable ITU-R regulations. The final version of the requirement addresses all concerns voiced by FSMP members.

4.4. The FSMP reviewed and validated these SARPs for regulatory compliance.

5. CONCLUSIONS

5.1. The AVSI study verified that if EIRP spectral density generated by WAIC aboard a single aircraft does not exceed 6dBm/MHz, then performance of altimeters aboard other aircraft will not be negatively affected. Thus, a total EIRP of -20dBm/200 MHz will be well below the threshold for interference.

5.2. The conclusion holds in most unfavorable worst case operational scenarios, under a set of conservative worst case assumptions.

5.3. FSMP concludes that the -20 dBm EIRP limit on the total emissions of all WAIC transmitters on board an aircraft is an appropriate requirement for WAIC and satisfies the condition of protecting radio altimeters.

5.4. All requirements in WAIC SARPs were validated by FSMP for regulatory compliance.

— END —



FSMP/3-WP/03
2022-09-07

FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

THIRD MEETING

Virtual Meeting, 7 September 2022

AGENDA ITEM 5

The attached constitutes the report on Agenda Item 5 and should be inserted at the appropriate place in the yellow folder.

Agenda Item 5: Review and update of existing job cards and development of new Job cards

5.1 Under this agenda item, the Panel reviewed the work programme as a whole through a review of the individual Job-Cards (FSMP/3 WP/01), developed as output from FSMP-WG/15 (22 August – 1 September 2022).

5.2 Minor amendments were proposed to all Job-Cards, mainly reflecting an update in accordance with the four-yearly ITU World Radiocommunication Conference cycle. No new Job-Cards were proposed.

5.2.1 The new Annex 10 Vol VI was added as a reference document for Job-Card FSMP.001 “*Maintenance and update o the ICAO frequency spectrum strategy and policy*” and the RPASP and ICNSS-TF were added as supporting expert groups. Similarly the new Annex 10 Vol VI was added as a reference document for Job-Card FSMP.003 “*Maintain ITU Radioregulatory framework relevant to aviation and keep ICAO provisions and the ITU Radioregulatory framework in sync*”. Here the ICNSS Task Force (ICNSS-TF) was added as well to reflect spectrum-use improvement actions and the FLTOPSP was added to reflect support to actions such as facilitating protection of frequency spectrum for Enhanced Flight Vision Systems. Reflecting support to work on-going in other CNS related Panels (SP, CP, NSP and RPASP) minor modifications were made to Job-Card FSMP.005.02 “*Develop and maintain SARPs and guidance material to facilitate frequency management of communications, navigation and surveillance systems*”. Job-Card FSMP.006.01 “*Develop radio frequency and interference rejection characteristics for radio altimeters*” was updated in accordance with the on-going work developing radio altimeter (RA) guidance within EUROCAE and RTCA, and reflecting the on-going RA/5G mitigations. Given the current progress of work within EUROCAE and RTCA it is envisioned that the RA SARPs deliverable out of FSMP will be finalized by 2025. The Job-Card has been amended to indicate Annex 10 Volume V as the intended placeholder for the deliverable. Noting the agreed new WAIC SARPs deliverable, Job-Card FSMP.007.01 was touched to reflect the deliverable being envisaged for Annex 10 Volume V and to indicate the envisaged effective and applicability dates of the new SARPs.

5.3 The Panel makes the following recommendations in relation to amendment to existing Job-Cards and approval of new Job-Cards:

RECOMMENDATIONS:**Recommendation 5/1 Amend Job-Card FSMP.001.01**

That this Job Card be amended as shown in the Appendix to the report on this agenda item, adding the new Annex 10 Vol VI as a reference document and adding the RPASP and ICNSS-TF as supporting expert groups. Dates are updated to reflect timely output for the ITU World Radiocommunication Conference in 2027 (WRC-27).

Recommendation 5/2 Amend Job-Card FSMP.002.01

That this Job Card be amended as shown in the Appendix to the report on this agenda item. Slight editorial updates are being proposed and the dates are updated to reflect timely output for the next ITU World Radiocommunication Conference (WRC-23)

Recommendation 5/3 Amend Job-Card FSMP.003.01

That this Job Card be amended as shown in the Appendix to the report on this agenda item, adding the new Annex 10 Vol VI as a reference document and adding two supporting expert groups, the ICNSS-TF to reflect spectrum-use improvement actions and the FLTOPSP to reflect support to actions such as facilitating protection of frequency spectrum for Enhanced Flight Vision Systems. Dates are updated to reflect timely output for the ITU World Radiocommunication Conference in 2027 (WRC-27).

Recommendation 5/4 Amend Job-Card FSMP.004.02

That this Job Card be amended as shown in the Appendix to the report on this agenda item, to reflect timely output for the ITU World Radiocommunication Conference in 2027 (WRC-27).

Recommendation 5/5 Amend Job-Card FSMP.005.02

That this Job Card be amended as shown in the Appendix to the report on this agenda item, adding the new Annex 10 Vol VI as a reference document. Reflecting support to work on-going in other CNS related Panels (SP, CP, NSP and RPASP), description has been amended and those panels added as Supporting Expert Groups. Dates are updated to reflect timely output for the ITU World Radiocommunication Conference in 2027 (WRC-27).

Recommendation 5/6 Amend Job-Card FSMP.006.01

That this Job Card be amended as shown in the Appendix to the report on this agenda item. The “Document Affected” column has been modified to indicate Annex 10 Volume V as the intended target for the deliverable and the on-going work developing radio altimeter (RA) guidance within EUROCAE and RTCA is being reflected. The Action field has been superseded by the on-going RA/5G mitigations. Given the current progress of work within EUROCAE and RTCA it is envisioned that the RA SARPs deliverable out of FSMP will be finalized by 2025.

Recommendation 5/7 Amend Job-Card FSMP.007.01

That this Job Card be amended as shown in the Appendix to the report on this agenda item. Noting the agreed new WAIC SARPs deliverable, the Job-Card FSMP.007.01 was touched to reflect the deliverable being envisaged for Annex 10 Volume V and to indicate the envisaged effective and applicability dates of the new SARPs.

ATTACHMENT: Recommended Updates to FSMP Job-Cards

Title	Maintenance and update of the ICAO frequency spectrum strategy and policy		Reference:	FSMP.001.042		
Source	FSMP/13 Report					
Problem Statement	Establish timelines and methodologies to complement the GANP planning objectives with a frequency spectrum strategy					
Specific Details (including impact statements)	<p>Develop and maintain a high level spectrum strategy, describing the long term spectrum use and requirements of aeronautical C, N, and S systems.</p> <p>Develop and maintain a detailed spectrum policy on the continued use of each frequency band in current use by aviation, providing for specific actions that have been identified to assist in meeting the strategic objectives of the air navigation plan.</p> <p>Updates to Spectrum Strategy and Policy are approved by Council.</p>					
Expected Benefit	Timely availability and appropriate protection of adequate spectrum to create a sustainable environment for growth and technology development to support safety and operational effectiveness for current and future operational systems and allow for the transition between present and next generation technologies.					
Reference Documents	Doc 9718 Vol I, Annex 10 Volumes I, III, IV, V and VI. GANP					Attachments N
Primary Expert Group:	FSMP					
WPE No.	Document affected	Description of Amendment proposal or Action	Supporting Expert Group	Expected dates:		
				Expert Group	Effective	Applicability
4128 <u>9521</u>	Doc 9718, Vol I	Update proposals to the ICAO spectrum strategy, mapping out the future requirements for spectrum to support communication, navigation and surveillance systems, in close cooperation with the panels responsible for those systems.	CP, NSP, SP, RPASP, ICNSS TF	Q1 2017 <u>Q4 2026</u>		
4128 <u>9522</u>	Doc 9718, Vol I	Update proposals to the detailed ICAO Policy on all relevant aeronautical frequency spectrum allocations, reflecting updates to the spectrum strategy as well as updates made in ITU to the Radio Regulations.	CP, NSP, SP, RPASP, ICNSS TF	Q1 2017 <u>Q4 2026</u>		
4128 <u>9523</u>	Doc 9718, Vol I	Update Doc 9718 "Handbook on Radio Frequency Spectrum Requirements for Civil Aviation" in line with Strategy/Policy updates and in line with updates of Annex 10 SARPs and decisions of ITU World Radiocommunication Conferences.		Q1 2017 <u>Q4 2028</u>		
Initial Issue Date: 2015-10-01		Date approved by ANC: 2015-10-01		Session/Meeting: 200-4		

Title		ITU Radio Regulations (RR) and ITU World Radiocommunication Conferences (WRC)		Reference:	FSMP.002.042	
Source		FSMP/13 Report				
Problem Statement		<p>Frequency Spectrum is a finite resource and a key enabler for aeronautical communications, navigation and surveillance systems, critical for the safety of flight. Access to frequency spectrum by the various users, including aviation, is governed by decisions made by the ITU WRCs.</p> <p>Promote and safeguard the interests of civil aviation to the extent possible by developing a coordinated Position on the various items addressed by the WRCs.</p>				
Specific Details (including impact statements)		<p>The RR are updated through regular ITU WRCs, held every three to four years.</p> <p>WRC preparatory work is supported by national Radio Regulatory Authorities as well as the various frequency spectrum users (lobby groups). Insufficient support of this item by aviation may result in loss of required protection of spectrum for <u>critical</u> safety of life critical applications, limitations<u>constraints on aviation spectrum</u>, or loss of required spectrum resource altogether.</p>				
Expected Benefit		Facilitate access to spectrum to support current and future aviation requirements.				
Reference Documents		ICAO Position for WRC, Assembly Resolution A38-6, Doc 9718 Vol I, ITU RR, ITU-R Recommendations and Reports.			Attachments	N
Primary Expert Group:		FSMP				
WPE No.	Document affected	Description of Amendment proposal or Action	Supporting Expert Group	Expected dates:		
				Expert Group	Effective	Applicability
1221	ICAO Position	Develop and coordinate, through State review and Council approval, an ICAO Position on the various items on the agenda of an upcoming ITU WRC.		Q2-2017 Q2-2023 (Q2-2027)	Q3-2017 Q3-2023 (Q3-2027)	
1218	Input material to ITU-R	Develop technical analyses and other input material for meetings of the ITU Radiocommunication Sector (ITU-R) to assist with their WRC preparatory studies.		Q4-2019 Q3-2023 (Q3-2027)		
1477	WRC prep workshops in the ICAO Regions	Assist ICAO Secretariat to conduct frequency spectrum workshops in the ICAO Regions		Q4-2018 Q3-2023 (Q3-2027)		
Initial Issue Date: 2015-10-01		Date approved by ANC: 2015-10-01		Session/Meeting: 200-4		

Title	Maintain ITU Radio-regulatory framework relevant to aviation and keep ICAO provisions and the ITU Radio-regulatory framework in sync	Reference:	FSMP.003.04 ₂			
Source	FSMP/4 ₃ Report					
Problem Statement	<p>Technical characteristics for some aeronautical systems are contained within the ITU Radioregulatory framework (ITU-R Recommendations and Reports) rather than in ICAO SARPs. An example of this is Primary Surveillance Radars.</p> <p>ITU Radio regulatory updates necessitate updates to ICAO provisions from time to time. Similarly, the other direction holds true as well.</p>					
Specific Details (including impact statements)	ITU-R Recommendations and Reports are developed and maintained through regular meetings of ITU-R Study Groups. Develop input material for consideration by ITU-R, relevant to aeronautical communication, navigation and surveillance systems.					
Expected Benefit	Keep the ICAO and the ITU regulatory frameworks in harmony to ensure global and interference free operations of aeronautical CNS systems and compatibility between aeronautical and non-aeronautical services.					
Reference Documents	Annex 10 Vol I, III, IV, V and VI, as well as ITU-R Recommendations and Reports.				Attachments	N
Primary Expert Group:	FSMP					
WPE No.	Document affected	Description of Amendment proposal or Action	Supporting Expert Group	Expected dates:		
				Expert Group	Effective	Applicability
4173 9524	Input material to ITU-R	Develop input material as required for relevant ITU-R Recommendations and Reports which impact the operation of aeronautical systems.	SP, CP, NSP, RPASP, <u>FLTOPSP</u> , <u>ICNSS TF</u> ...	Q4 2019 Q3 2027		
4173 9525	ICAO provisions Input material to ITU-R	Monitor changes to the ICAO or ITU regulatory frameworks, including due to WRC decisions, and trigger development of appropriate updates if/as necessary to ensure that those frameworks remain consistent.	SP, CP, NSP, RPASP, <u>FLTOPSP</u> , <u>ICNSS TF</u> ...	Q4 2019 Q3 2027		
Initial Issue Date: 2015-10-01		Date approved by ANC: 2015-10-01		Session/Meeting: 200-4		

Title		Address radio frequency interference issues for aviation and the need for action by States, ICAO and international organizations together		Reference:	FSMP.004.023	
Source		FSMP/13 Report				
Problem Statement		Interference, including aeronautical sources, non-aeronautical sources, and malicious interference needs to be addressed. Activities include securing the protection of aeronautical communication, navigation and surveillance systems from the adverse effects of electromagnetic interference and ensuring an operating environment in which the avionics can safely operate without impacts of harmful interference. New interference issues need to be addressed in a timely manner, on a case by case basis, as they appear.				
Specific Details (including impact statements)		In order to ensure safe and efficient aeronautical operations, interference free operation of communication, navigation and surveillance systems and other on-board avionics critical for safety and regularity of flight is required				
Expected Benefit		Interference free operation of communication, navigation and surveillance systems and other on-board avionics that are critical for safety and regularity of flight				
Reference Documents		AN-Conf/11, Rec 5/2			Attachments N	
Primary Expert Group:		FSMP				
WPE No.	Document affected	Description of Amendment proposal or Action	Supporting Expert Group	Expected dates:		
				Expert Group	Effective	Applicability
1215	Doc 9718 Vol I (interference and its mitigation)	Increase the awareness of member states concerning interference of various types and possible methods for its resolution		Q4 2019		
1217	Doc 9718 Vol II (assignment planning criteria)			Q3 2027		
Initial Issue Date: 2015-10-01		Date approved by ANC: 2016-11-24		Session/Meeting: 203-4		

Title		Develop and maintain SARPs and guidance material to facilitate frequency management of communication, navigation and surveillance systems	Reference:	FSMP.005.023		
Source		FSMP/43 Report				
Problem Statement		In conjunction with other Panels, develop frequency assignment planning criteria to facilitate efficient and interference free operation of aeronautical communication, navigation and surveillance systems to ensure economical, efficient and safe use of the frequency spectrum resource				
Specific Details (including impact statements)		Frequency assignment planning criteria are required for efficient, safe and interference free use of the resource in light of increasing congestion of the frequency bands.				
Expected Benefit		Efficient and interference free (safe) use of aeronautical frequency spectrum bands.				
Reference Documents		Annex 10, Vol V and Doc 9718 Vol II. Secondary interdependencies: Annex 10 Vol I, III, IV <u>and VI</u>			Attachments N	
Primary Expert Group:		FSMP				
WPE No.	Document affected	Description of Amendment proposal or Action	Supporting Expert Group	Expected dates:		
				Expert Group	Effective	Applicability
629	Annex 10 Vol V (and potentially also Vol's I, III, IV) Doc 9718, Vol II Ed 3	New provisions to support future aeronautical radiocommunications including any provisions necessitated by the outcome of WRCs.	SP, CP, NSP, RPASP	Q4 2019 Q4 2026	Q2 2022 Q2 2027	Q4 2022 Q4 2027
1474	Doc 9718, Vol II, Ed 23	Create new, and improve update existing, frequency assignment planning criteria for the aeronautical frequency bands 117.975 – 137 MHz (expect improvements in adjacent channel criteria)	SP, CP, NSP, RPASP	Q4 2018 Q4 2026	Q3 2019 Q3 2027	
619	Annex 10 Vol V (and potentially also Vol's I, III) Doc 9718, Vol II Ed 3	Decisions made by WRC-12 enable use of p Portions of the 5030-5150 MHz band <u>are used</u> by AeroMACS and RPAS C2 terrestrial and satellite, in addition to the existing MLS use of the band. In order to enable safe co-use of the band by these services, appropriate ICAO provisions have to be developed	CP, RPASP	Q4 2018 Q4 2026	Q2 2020 Q2 2027	Q4 2020 Q4 2027
Initial Issue Date: 2015-10-01		Date approved by ANC: 2016-11-24		Session/Meeting: 203-4		

Title	Develop radio frequency and interference rejection characteristics for radio altimeters		Reference:	FSMP.006.042		
Source	FSMP/23 Report					
Problem Statement	Recent ITU activities have threatened aeronautical systems operating in the 4200-4400 MHz band by considering the introduction of mobile broadband systems in adjacent frequency bands. Existing ITU-R documentation, and related documentation such as RTCA DO-155 <i>Minimum Performance Standard Airborne Low-Range Radar Altimeters</i> , describe some performance characteristics for radio altimeters, however additional/refined details are necessary to enable a proper assessment of suitable protection requirements for systems operating on adjacent frequency bands. Without standardized frequency and interference performance characteristics, there is no way to specify suitable protection from interference from services operating in adjacent frequency bands. This creates safety risks to flying aircraft operating radio altimeters, especially noting that non-aeronautical systems can now operate at the adjacent frequency bands.					
Specific Details (including impact statements)	Radio frequency interference rejection characteristics and associated standards for radio altimeters are needed to ensure frequency sharing compatibility between aircraft radio altimeters and other aeronautical applications, namely Wireless Avionics Intra-Communications (WAIC), in the same band. Furthermore, out-of-band interference susceptibility and rejection characteristics are also required for protecting the operations of the radio altimeters from harmful interference caused by non-aeronautical systems operating in adjacent frequency bands.					
Expected Benefit	Protection of continued safe operations of radio altimeters from potentially harmful in-band and adjacent band radio frequency interference, and guidance for future radio altimeter design.					
Reference Documents	Annex 10, Vol V ARINC 707-7B Eurocae ED-30/ED-30A Minimum Performance Standard Low-Range Radar Altimeters RTCA DO-155/DO-155A Minimum Performance Standard Low-Range Radar Altimeters Recommendation ITU-R M.2059 "Operational and technical characteristics and protection criteria of radio altimeters utilizing the band 4 200-4 400 MHz", approved Feb. 2014					Attachments Nil
Primary Expert Group:	FSMP					
WPE No.	Document affected	Description of Amendment proposal or Action	Supporting Expert Group	Expected dates:		
				Expert Group	Effective	Applicability
9661	Annex 10, Vol. V	Referencing material from Standard Making Organisations, develop technical provisions defining technical aspects relating to radio frequency and interference rejection characteristics of the radio altimeters. Final location of material to be determined.	FLTOPSP	Q1-2019 [Depends on WAIC measurement effort] Q2-2025		
9662	Action	Conduct an aircraft fleet equipage impact analysis and develop detailed transition plans based on industry input and expected safety benefit.	AIRP FLTOPSP	Q1-2019		
Initial Issue Date: 2016-11-24		Date approved by ANC: 2016-11-24		Session/Meeting: 203-4		

Title	Develop and maintain SARPs and guidance to prevent WAIC / Radio Altimeter interference		Reference:	FSMP.007.042		
Source	FSMP/23 Report					
Problem Statement	Changes to the international radio frequency regulations agreed to at the 2015 World Radiocommunication Conference (WRC-15) provide for use of the frequency band 4 200 – 4 400 MHz for both Wireless Avionics Intra-Communications (WAIC) systems under the aeronautical mobile (route) service, and radio altimeters under the aeronautical radionavigation service. The associated Resolution 424 (WRC-15) requires that the WAIC systems protect the operation of the radio altimeters and operate in accordance with SARPs as contained in Annex 10 to the ICAO Convention. These changes require ICAO to develop SARPs to prevent interference between WAIC systems and radio altimeters in order to ensure the safe operation of aircraft. Furthermore, high-level guidance is needed to ensure coexistence of multiple WAIC systems on board different aircraft. Currently, RTCA and EUROCAE are developing MOPS for WAIC systems.					
Specific Details (including impact statements)	<p>Radio frequency interference rejection characteristics and associated standards for radio altimeters and WAIC systems are needed to ensure frequency sharing compatibility between WAIC systems, radio altimeters and potential interference from out-of-band sources such as potential terrestrial cellular systems.</p> <p>It is thus necessary that the SARPS specifically cover the following elements:</p> <ul style="list-style-type: none"> - Requirement that WAIC systems have to tolerate interference coming from radio altimeters from another aircraft - Requirement that WAIC systems on one aircraft shall not interfere with WAIC systems on other aircraft - Requirement that WAIC systems shall not interfere with radio altimeters on other aircraft¹ - Receive mask(s) specifying required adjacent band / out-of-band suppression properties of a WAIC receiver - In-band emission properties of a WAIC transmitter, particularly transmit power levels and channel plan - Transmit mask(s) specifying out-of-band emission properties of a WAIC transmitter <p>Wherever possible the SARPS should reference MOPS to avoid having to update SARPS if MOPS are updated.</p> <p>WAIC system compatibility with radio altimeters on-board the same aircraft will be addressed via aircraft system integration and certification.</p>					
Expected Benefit	Mutual protection criteria ensuring the safe operation and required performance of both WAIC and Radio Altimeters.					
Reference Documents	<p>Final Acts WRC-15, Geneva 2015</p> <p>Report ITU-R M.2283 "Technical characteristics and spectrum requirements of Wireless Avionics Intra-Communications systems to support their safe operation", approved Dec. 2013</p> <p>Recommendation ITU-R M.2059 "Operational and technical characteristics and protection criteria of radio altimeters utilizing the band 4 200-4 400 MHz", approved Feb. 2014</p> <p>Report ITU-R M.2318 "Technical characteristics and protection criteria for Wireless Avionics Intra-Communications systems", approved Nov. 2014</p> <p>Report ITU-R M.2319 "Compatibility analysis between wireless avionics intra-communication systems and systems in the existing services in the frequency band 4 200-4 400 MHz", approved Nov. 2014</p> <p>Recommendation ITU-R M.2067 "Technical characteristics and protection criteria for Wireless Avionics Intra-Communication systems", approved in Nov. 2014</p> <p>Recommendation ITU-R M.2085 "Technical conditions for the use of the aeronautical mobile (R) service in the frequency band 4 200- 4 400 MHz to support wireless avionics intra-communication systems"</p> <p>Minimum Operational Performance Standards (MOPS) for WAIC (to be developed by SMO)</p>				Attachments	
Primary Expert Group:	FSMP					
WPE No.	Document affected	Description of Amendment proposal or Action	Supporting Expert Group	Expected dates:		
				Expert Group	Effective	Applicability
9660	Annex 10, Vol V	New provisions for WAIC / Radio Altimeter interoperability.	CP, NSP	Q4 2019 Q3 2022	Q2 2022 Q2 2025	Q4 2022 Q4 2025
Initial Issue Date: 2016-11-24		Date approved by ANC: 2016-11-24	Session/Meeting: 203-4			



FSMP/3-WP/03
2022-09-07

FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

THIRD MEETING

Virtual Meeting, 7 September 2022

AGENDA ITEM 6

The attached constitutes the report on Agenda Item 6 and should be inserted at the appropriate place in the yellow folder.

Agenda Item 6: Future work programme of the FSMP

6.1 No input papers were addressed under this agenda item.

6.2 It was reported that the work on minimum operational performance standards (MOPS) by a joint committee of EUROCAE and RTCA is ongoing, with two deliverables foreseen, RTCA DO-XXX “Guidance Document on Radar Altimeter Radio Frequency (RF) Interference Rejection and Tolerance”; and RTCA DO-155A “MOPS for Low Range Radar Altimeters” (these documents will also have corresponding EUROCAE “ED” numbers).

6.2.1 The interim work package, looking at possible performance standards, is foreseen to be finalized by the end of this year and the outcome will correspondingly be captured in the EUROCAE/RTCA standards by the end of next year.

6.2.2 The meeting agreed that the high level Radio Altimeter SARPs, which will leverage and support the outcome of this work, would need two meetings in 2024 for finalization. Correspondingly, FSMP/4 is tentatively scheduled for Q2 2025, the main goal of that meeting being to finalize the initial Radio Altimeter SARPs deliverable to the ANC for a preliminary review.

6.3 Two FSMP WG meetings are scheduled for 2023, in conjunction with WRC-23 preparatory Workshops to provide information and guidance to aeronautical CNS and Spectrum colleagues in the APAC and MID regions.

6.3.1 FSMP WG/16 (7 or 8 working days preceded by a two day APAC preparatory Workshop for the WRC-23) is tentatively scheduled to be held at the ICAO APAC Office, 20 Feb – 3 Mar 2023. The main task of this meeting will be to finalize any updates to the ICAO Position for the Conference, such that those can be sent to ANC and Council for timely approval.

6.3.2 The final meeting before WRC-23, FSMP WG/17 (preceded by a two day MID preparatory Workshop for the WRC-23), is tentatively scheduled to be held at the ICAO MID Office, 28 Aug – 8 Sep 2023.



FSMP/3-WP/03
2022-09-07

FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

THIRD MEETING

Virtual Meeting, 7 September 2022

AGENDA ITEM 7

The attached constitutes the report on Agenda Item 7 and should be inserted at the appropriate place in the yellow folder.

Agenda Item 7: Any other business

7.1 No input papers were addressed under this agenda item.

7.2 The meeting discussed briefly the status of work within the ITU World Radiocommunication Conference (WRC) process, in particular with regard to WRC-23 Agenda Item 10, which addresses potential Agenda Items for future WRCs.

7.3 The meeting identified a potential future item on 1.3 – 1.35 GHz L-band long-range Air Traffic Control radars as well as a potential task as the outcome of the current WRC-23 agenda item 1.6 (sub-orbital vehicles).

7.4 The meeting agreed that overall it would be good from an aeronautical perspective to have a “quiet” WRC cycle, which could be used to catch up on aeronautical ITU-R Recommendations, many of which may be well out-of-date.

7.5 With a potentially slightly reduced attention required to the WRC process during the upcoming WRC cycle, core work such as the restructuring of Doc 9718 (Radio Frequency Handbook) is foreseen to commence, as well as due attention to the work being progressed by the ICNSS Task Force.



FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

THIRD MEETING

Virtual Meeting, 7 September 2022

APPENDIX

The attached constitutes an Appendix to the Report of FSMP/3 and should be inserted at the appropriate place in the yellow folder.

Note: The PDF version of the Report of FSMP WG/15, as attached hereto, does not include all the material referenced in the Appendices to that Report. The full version, including appendices is available at:

<https://www.icao.int/safety/fsmp>



International Civil Aviation Organization

1 September, 2022

REPORT

FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP) FIFTEENTH MEETING OF THE WORKING GROUP OF FSMP (FSMP-WG/15)

Hybrid
22 August-1 September, 2022

REPORT

1. Opening and Working Arrangements

1.1 The hybrid (in-person and electronic/virtual) meeting was opened by Mr Loftur Jonasson from the ICAO Secretariat, Montreal and Mr Mike Biggs, the Rapporteur of Working Group FSMP (FSMP-WG). The in-person portion of the meeting was held at the IATA offices in Montreal, Canada and the meeting greatly appreciated the facilities. Mr Jonasson acted as the Secretary of the meeting. Mr Biggs welcomed the group and provided introductory remarks and meeting information. Lastly, it was noted that as for last few meetings, developing a run-of-meeting schedule was much simpler due to membership providing input contributions in a timely manner, and the cooperation was appreciated.

1.2 The meeting was held in English. After the opening of the meeting the agenda was approved by the group. The agenda is contained in Appendix A.

1.3 The list of papers submitted for consideration by FSMP-WG/15 is contained in Appendix B. The list of participants is in Appendix C.

1.4 The material in this report is organized by meeting agenda item number, and does not necessarily reflect the order of discussions. Actions captured during discussions are shown in Appendix D, together with status of prior-meeting(s) actions. Regarding the latter, an extensive review of old action items was performed and a number were deleted/updated.

2. Agenda Item 2 – ICAO WRC-23 Position

2.1 Identified conflicts between administration preliminary proposals and ICAO Position

2.1.1 No contributions were received on this topic.

2.2 Discussion of possible future agenda item proposals from administrations

2.2.1 No contributions were received on this topic.

2.3 Modifications/Updates to the ICAO WRC-23 Position

2.3.1 Three papers (WP06, WP09 and WP23) were received with proposed changes to the ICAO Position. In addition, several proposals were considered that were not resolved at FSMP-WG/14, and one proposal was pulled from WP11. A Flimsy was developed that combined all proposals and was used by the meeting for the review. An updated Flimsy is contained in Appendix E containing all the agreed language as well as some proposals highlighted in yellow that were not resolved. That document will be used as a basis for any further contributions and discussions at FSMP-WG/16.

3. Agenda Item 3 – Development of (planned) material for ITU-R studies

3.1 WRC-23 AI 1.6 Suborbital Vehicles

3.1.1 WP04 presented a Liaison Statement from ITU-R WP5B, providing a copy of the latest version of the working document towards a preliminary draft new Report, entitled “Regulatory, operational, and technical studies of radiocommunications for suborbital vehicles.” The meeting appreciated the information.

3.1.2 WP20 noted that, within Europe, the ECHO (European Concept of Higher airspace Operations) research project conducted under the SESAR umbrella was currently working on an air traffic management concept of operations for higher airspace operations, including potential future suborbital flights. The paper further suggested that FSMP liaise to that group to get information on which systems were envisioned to be on the suborbital vehicle to facilitate that process. An informal drafting group developed a proposed liaison, the text of which is contained in Appendix G.

3.2 WRC-23 AI 1.7 VHF AMS(R)S

3.2.1 A large number of papers were received on the topic of WRC-23 agenda item 1.7. To manage the discussion, they were broken into 3 groups: (a) papers associated with ICAO and/or ITU coordination, (b) papers associated with technical/operational performance issues, and (c) papers associated with liaison to ITU-R WP5B. Once all of the papers within a certain category were introduced, then the meeting held an overall discussion.

3.2.2 Coordination

3.2.2.1 The meeting agreed to structure discussion of “coordination” on two specific areas: (a) Coordination procedures within ITU, (b) Coordination (and/or planning) within ICAO. In particular it was noted that decisions on the former needed to be made in time to implement at WRC-23, whereas at least some parts of the latter could be deferred until after the Conference.

3.2.2.2 WP02 proposed a set of questions to help guide contributions to FSMP on the expected ICAO coordination process for any new VHF AMS(R)S services. The paper recommended that the outcome of discussions should be liaised to the ITU-R, and eventually documented in a draft update of Annex 10, Vol. V.

3.2.2.3 WP11 reported on progress made on studies for technical compatibility of potential new allocation in the frequency band 117.975 – 137 MHz to the aeronautical mobile satellite (on route) service with respect to other services operating in adjacent bands. Based on that progress, suggestions were made for updates to the ICAO Position. The meeting could not conclude regarding selecting specific CPM Methods since that text was not yet complete, however there was agreement to add to the Position on AII.7 to oppose any proposals that systems operating under the new AMS(R)S allocation cannot cause interference to, and/or claim protection from, systems operating in non aeronautical-safety services. The paper also included material to be used in the preparation of the Liaison Statement.

3.2.2.4 WP15 noted that ITU-R WP5B has been working on a draft report ITU-R M.[SPACE-VHF] containing interference studies and specifically addressing the expectation that ICAO would conduct any necessary planning exercise regarding in band sharing services. The paper addressed in-band sharing between AMS(R)S, AM(R)S and AM(OR)S to assist ICAO in that planning effort. It was also noted that the preliminary analysis could serve as response from ICAO to WP 5B by confirming that frequency planning, potential allotment plan and coordination of operational frequencies for all services involved will be undertaken and completed by ICAO at a future stage.

3.2.2.5 WP17 identified a number of concerns regarding the studies currently being undertaken on WRC-23 AII.7. During the discussion, it was identified a number of missing topics and inconsistencies (mostly on the regulatory front) regarding the studies currently being undertaken on WRC-23 AII.7, and noted that there appeared to be a need of further clarification on the overall regulatory framework and some technical assumptions, that needs to be addressed in order to allow a positive decision at the conference.

3.2.2.6 WP18 paper investigated potential coordination mechanisms available within the Radio Regulations that could be used for the coordination of systems operating in the AMS(R)S with systems operating in the AM(R)S. For each potential coordination mechanism, the information that would have to be generated and the advantages/disadvantages of each mechanism were identified.

3.2.2.7 WP22 provided a comparison between RR Nos. **9.11A** and **9.21** based on studies performed in another aeronautical frequency band. The paper concluded that for the case of AMS(R)S under WRC-23 AI 1.7, RR No. **9.11A** coordination would be a preferable approach.

3.2.2.8 WP24 was a response to WP 03 of FSMP-WG/14, in particular sharing information on the current VHF frequency coordination procedure carried out in Asia Pacific (APAC) Region for the frequency band 117.975 – 137 MHz. In addition, the paper proposed that a coordination procedure similar to that currently used for AM(R)S could also be used for coordinating between future AMS(R)S, AM(OR)S and AM(R)S.

3.2.3 Technical/operational issues

3.2.3.1 WP12 highlighted that ANSPs and airlines are requiring more and more datalink communications for increased ATC automation, allowing extra capacity while improving safety. The paper noted that complementary use of VHF voice and VHF data (CPDLC and ADS-C) with surveillance information through ADS-B would facilitate the introduction of functionalities such as Trajectory Based Operations (TBO), Free Route Airspace (FRA) and 4D Trajectory Datalink (4DTRAD) in oceanic airspace, in regions where this can be shown to bring productivity benefits. The paper generated considerable discussion by the meeting, in particular the meeting suggested that when discussing satellite VHF the community should focus on explaining the potential benefits that could not be achieved via other means. There was general support to continue studies regarding the full 117.975-137 MHz band. Studies should properly address the challenges ahead, while distinguishing between actions that will have to be undertaken by the aeronautical community at any

appropriate time (like the above noted topics), with respect to those other mandatory actions to be done on time for WRC23 AI 1.7 (technical compatibility studies). Care should be taken that aviation proposals should not be structured such that any remaining issue with digital datalink in the 136-137 MHz band results in objection to any AMS(R)S allocation at all.

3.2.3.2 WP13 presented the results of technical studies related to the spectrum sharing of Space-based VHF system with AM(R)S within the 117.975 – 137 MHz frequency band. The paper focused on assessing Doppler impacts, concluding that for the envisioned satellite system it would not be an issue. The paper also provides evidence that Space Based VHF systems will be able to handle Doppler without a need for aircraft avionics modifications.

3.2.3.3 WP14 proposed an approach to minimize the impact on existing systems while still being able to operate an economically viable Data Link Service under the potential future AMS(R)S allocation in the VHF frequency band.

3.2.3.4 During FSMP WG/13 it was agreed to create a Satellite VHF Coordination Group (CG-SV) to develop a set of frequently asked questions (FAQs) regarding the AMS(R)S (Aeronautical Mobile Satellite (R) Services) concept. IP05 (including attachment) contains the current collection of questions and answers (Q&As). This material will be updated regularly to be delivered in different ICAO and/or ITU groups that are working on the WRC-23 Agenda item 1.7 topic.

3.2.3.5 The presentations of the papers resulted in considerable discussion. In the end the meeting noted a number of points:

- Consistent with the agenda item Resolution, implementation shall be made without changes to VDL Mode 2 avionics, and the proponents believe, subject to confirmation, this will be possible.
- In the view of the proponents, implementation of the space based VHF system could require configuration changes to existing VDL Mode 2 avionics radios that wanted to participate in the satellite system, and making those configuration changes should be fairly simple. Those changes would not impact the ability of those radios, or other non-modified VDL Mode 2 radios, to operate with terrestrial VDL Mode 2 networks. The group agrees that further investigation on this aspect is needed, including whether the envisioned changes are within the scope of the Resolution.
- No changes to VDL Mode 2 emissions would be required

3.2.3.6 Representatives from the current terrestrial VDL Mode 2 service providers (i.e., SITA and Collins) indicated that a space-based VDL Mode 2 service could be feasible. While one service provider was confident of the implementation, the other noted it still had outstanding questions that had yet to be addressed for both the technical implementation and the protection of, and coordination with, existing terrestrial services.

3.2.4 Liaison to WP5B

3.2.4.1 WP03 contained a Liaison Statement from ITU-R WP5B requesting information regarding the aeronautical VHF coordination process(es) between AM(R)S assignments and between AM(R)S and AM(OR)S assignments, with the goal of understanding how possible new AMS(R)S assignments could be included. The document also included a copy of the Preliminary draft new Report ITU-R M.[Space-VHF].

3.2.4.2 WP16 provided a proposed response to the liaison from ITU-R WP5B contained in WP03. The proposed responds answered specific questions and provided information on the elements being studied. The material was included in the drafting group discussions outlined below.

3.2.4.3 During discussions, some participants made emphasis that the ongoing studies at the ITU address the allocation to AMS(R)S and ITU would not conclude on endorsing any particular system implementation, nor assigning frequencies.

3.2.5 To progress the material a drafting group was formed which met several times during the meeting and via Email correspondence. The agreed output is shown in Appendix I.

3.3 WRC-23 AI 1.8 Resolution 155/FSS for UAS

3.3.1 WP05 provides background on the provisions in ITU regarding the treatment of allocations which are used or planned to be used for Aeronautical Radiocommunication. The purpose was to respond to questions during FSMP WG/14 in the context of the potential use of FSS for C2 links for the operation of unmanned aircraft systems (UAS). In particular, a debate on the use of recognized “aeronautical spectrum” versus “non-aeronautical spectrum” for safety purposes was highlighted. After discussion the meeting agreed that under certain specific conditions non-safety radiocommunication services could be used to support aeronautical safety communications, however it would need to be considered on a case-by-case basis.

3.4 WRC-23 AI 1.9 Wideband HF

3.4.1 No contributions were received on this topic.

3.5 WRC-23 AI1.10 Non-safety AMS

3.5.1 No contributions were received on this topic.

3.6 WRC-23 AI9.2 Radio Regulations clean-up

3.6.1 WP19 identified various inconsistencies within the Radio Regulations with some current aeronautical operating practices and technical requirements. Where those inconsistencies do not affect other services, the paper proposes how the current text could be modified to bring it into line with current operational practices. The meeting agreed that the paper offered a good basis for developing an element in the ICAO WRC-23 Position on agenda item 9.2 and participants were encouraged to bring specific proposals to FSMP-WG/16 [AI 15-02].

3.7 Other

3.7.1 WP01 was a liaison from ITU-R WP5B requesting information on the appropriate parameters to use for the protection of aeronautical Non-Directional Beacon receivers. This information is required for impact studies regarding Wireless Power Transmission for mobile device charging using non-beam magnetic inductive and magnetic resonant charging inter alia in the frequency band 315 - 405 kHz. Given the short deadline, Email coordination was performed with experts from the Navigation Systems Panel, and elements for a reply liaison are contained in Appendix H.

3.7.2 IP06 noted that Fixed Service (FS) systems were moved from the 24 GHz band after WRC-19 to a number of frequency bands including the 32 GHz band used by enhanced vision systems (EVS)/enhanced flight vision systems (EFVS). As a result, there are ongoing studies in ITU where ICAO support is needed. To help with those studies, the presentation provided information on one EFVS including operating characteristics and expected performance. The meeting appreciated the information.

3.7.3 WP21 expanded on the issues raised in IP06, noting that in addition to the frequency band 31.8-33.4 GHz (32 GHz band), the 95-100 GHz is also allocated to Radionavigation and FIXED services and being considered for EFVS. It was noted that EFVS are already identified in ICAO Annex 6, however specific frequencies are not listed. Finally, it was highlighted that RR No. 5.547A requires administrations to work to preclude interference to 32 GHz airborne radars. The paper provided an approach for a coordination process that accommodates FS and EFVS in the 31.8-33.4 GHz band, taking into account that the EFVS requires 320 MHz of bandwidth, indicating that a similar approach may be possible in other bands. To be considered in ITU studies, however, the frequency bands need to be recognized as bands identified for EFVS/EVS applications through a clear position from ICAO. After discussion the meeting agreed that this would most appropriately be done through additions to the Spectrum Handbook (Doc. 9718). The following links were provided for information:

Preliminary draft revision of Recommendation ITU-R F.1520-3 - Radio-frequency arrangements for systems in the fixed service operating in the band 31.8-33.4 GHz

<https://www.itu.int/md/R19-WP5C-C-0274/en>

M.1466 : Characteristics of and protection criteria for radars operating in the radionavigation service in the frequency band 31.8-33.4 GHz

<https://www.itu.int/rec/R-REC-M.1466>

Report CCE FH vs EFVS_32GHz

Report of the EMC Consultation Committee Electromagnetic Compatibility (ECC)

Coexistence between the fixed service and the radio navigation system in the frequency band 31.8-33.4 GHz

Part A: Interference from the fixed service on the EFVS

https://www.anfr.fr/fileadmin/mediatheque/documents/etudes/2019-10-17_RapportCCE_FHvsEFVS_PartieA_FinalV3.pdf

4. Agenda Item 4 – Radio Altimeter issues

4.0.1 IP03 provided radio altimeter (RA) interference susceptibility characteristics as measured at Japanese Sub-6 frequency conditions. Japanese Sub-6 frequency bands are 3.7 GHz–4.1 GHz and 4.5 GHz–4.6 GHz, (i.e., both sides of the RA band with the 100 MHz guard band). In particular in-band and out-of-band electromagnetic interference susceptibility was measured for 12 RAs used by large fixed-wing aircraft and 8 RAs used by medium/small fixed-wing aircraft and helicopters. The measurement procedures and the interference criteria were fundamentally same as those described in the RTCA 5G Interference Assessment Report, and ARINC429 altitude output or analog voltage output were obtained and evaluated. The meeting appreciated the information and in particular that there were now altimeter susceptibility results measured by different stakeholders that displayed similar levels. The meeting asked to be kept informed as data analyses proceed.

4.0.2 IP07 provided an initial comparison of published RF performance data for aviation and non-aviation receivers operating adjacently in the C-band. The intent was to show that in terms of adjacent band signal rejection, the radio altimeters were in general better than the performance specified in the 3GPP mobile standards. The meeting appreciated the analysis and noted it would be useful material to counter current criticism in some fora that “altimeters are looking outside their band”.

4.0.3 IP09 noted that ICAO has received studies from several States and organizations regarding the potential for 5G interference to radio altimeters. Those studies generally concluded that some models of radio altimeters will not operate as required if new cellular broadband technologies (5G) are deployed in frequency

bands close to the frequencies used by radio altimeter's operation (4.2-4.4 GHz). In reply to a request from the Secretariat of the ICAO HQ and considering the importance of this topic globally, the RADALT AG and ICAO MID office developed the draft guidance material presented in the IP and provided to FSMP for their information. The meeting appreciated the material, in particular that it addressed both technical issues and the operational impacts, and suggested that it could be updated and form the basis for an electronic bulletin or manual on the topic. All participants were given to the action [AI 15-01] to review the information regarding their State, and provide any updates as soon as possible to allow them to be reflected in the published version of the ICAO MID document. Those update should be sent to Mie Utsunomiya at (mutsunomiya@icao.int).

4.1 Report from correspondence group on radio altimeters (CG-RA)

4.1.1 IP08 provided a report of CG-RA and had the stated purpose to give a “full” picture of the issue and provide some guidance examples that could minimise the impact on Radio-Altimeter for all stakeholders. In particular it provided a catalogue of recent meetings, studies and test efforts on the topic and references where more information could be found. The meeting greatly appreciated the information and a large discussion ensued. It was noted that the mobile community in France was pushing for all radio altimeter related restrictions to be removed by July 2023. The meeting asked the CG to continue its work.

4.2 National efforts to implement broadband mobile near 4200-4400 MHz

4.2.1 Mitigation measures - No contributions were received on this topic

4.2.2 Safety cases/compatibility analyses - No contributions were received on this topic

5. Agenda Item 5 -- 5 GHz Planning

5.1 AeroMACS

5.1.1 No contributions were received on this topic

5.2 Global UAS/Remotely Piloted Aircraft Systems (RPAS) channel plan

5.2.1 WP10 was in response to FSMP Action Item 11-06 for members ‘to consider RPAS use of more than just the “2x10 MHz” for AMS(R)S communications in the 1.5/1.6 GHz L-Band’. The paper notes that at FSMP-WG/13 a number of criteria were identified to assess the suitability of a frequency band (see Section 5.5 of the FSMP WG/13 Meeting Report) for AMS(R)S, and suggests that FSMP responds to the RPAS panel that satellite-based RPAS C2 Links may be considered for operation within the MSS in the frequency bands 1 525-1 544/1 545-1 559 MHz and 1 626.5-1 645.5/1 646.5-1 660.5 MHz, provided there is a capability for the system to fall back to operating only in a sub-part of this band where priority is given within the Radio Regulations in accommodating the spectrum requirements of the AMS(R)S. The meeting agreed in principle the RPAS use of these bands, based on, the “generic AMS(R)S” use of the band (i.e., “Option 2” as documented in paragraph 5.5 of the FSMP-WG/13 report, now included in Annex 10, Volume III), however that would require a change to Annex 10, Volume V, Chapter 5. The trigger to begin such a change would be a request from the RPAS Panel.

5.2.2 IP02 (with attachment) provides an update on the discussion between EUROCAE WG-105 and RTCA SC-228 in regard to a compatible technical solution for the shared use of the 5030-5091MHz band by terrestrial, high-altitude airborne relay, and satellite based C2 Links. The paper included two options that were still being considered (splitting the band by frequency between AMS(R)S and AM(R)S or splitting the band in time between the two services). The meeting appreciated the information.

6. Agenda Item 6 -- Interference from Non-Aeronautical Sources

6.1 Mobile service communications adjacent to 1518 MHz satellite communications frequency band (see action item 14-04)

6.1.1 WP08 provided proposed edits to the text of the draft Guidelines/Information Note attached in Appendix H of the Report from FSMP-WG/12. The paper also suggests that consideration be given by FSMP on how the draft Guidelines/Note, once finalised and agreed, may be circulated by ICAO (e.g., through an ICAO State Letter or via another means). After discussion the meeting agreed that the document would be updated to:

- Add back the example of an administration only protecting SATCOM use at the gates;
- Include any updated material from the WP4C (September) and WP5B (November) meetings; and
- a revised version will be submitted early for FSMP-WG/16. That version will show track-changes versus the version from WG/14 with the comments from France to that meeting accepted.

Regarding how to disseminate the final product, it was mentioned that an electronic bulletin may be most appropriate.

6.2 LED lighting systems

6.2.1 No contributions were received on this topic

7. Agenda Item 7 -- Revision of ICAO Frequency Spectrum Handbook (Doc 9718)

7.0.1 No papers were received on the Spectrum Handbook topic, however a general discussion was had to re-baseline the material that had been received, and to solicit new contributions for FSMP-WG/16. General details on the topics discussed are contained in Appendix J. A correspondence group was established and members should contact Andy Roy (ACR@asri.aero) to participate.

7.1 Restructure of Volume I

7.1.1 No contributions were received on this topic

7.2 Update of Volume II

7.2.1 No contributions were received on this topic

8. Agenda Item 8 – Any other business

8.1 WP07 reported that FSMP WG/14 had agreed on a set of draft new proposed SARPs for WAIC and that those have been liaised with the Navigation Systems Panel (NSP) and the Communications Panel – Data Communication Infrastructure Working Group (CP-DCIWG) for comments. The draft new SARPs were liaised on 11 May 2022, with 30 June indicated as deadline for comments. As of 12 August, no comments have been received. The Secretariat has undertaken an editorial review of the draft new WAIC SARPs package. The draft SARPs as submitted to FSMP WG/14 had been written for insertion into Annex 10 Vol III, however FSMP WG/14 agreed that the WAIC SARPs would be a better fit for Annex 10 Volume V. The editorial review focused mainly on this aspect, while also taking note of the guidance provided in the “ANC Guide to the drafting of SARPS and PANS” and Assembly Resolution 39-22. Some minor edits were also made to the Impact Assessment and Implementation Plan (see Annex 2 of Attachment) and the Validation Statement (see Annex 3 of Attachment). The meeting performed a final review of the draft new WAIC SARPs package, to

facilitate a decision by FSMP/3, which will be held on 7 September 2022. The agreed material is contained in Appendix F.

8.2 IP01 contains the report of the June 2022 meeting of the ICAO NSP Spectrum Working Group, SWG. The following topics discussed in the SWG have particular relevance for the FSMP:

- Review of LDACS SARPs provided in the frame of inter-panel coordination by ICAO NSP
- Status of the development of revised LDACS versus DME/TACAN Compatibility Testing Plan
- Review of the recently published ICAO Doc 9718, Vol. II by ICAO NSP
- Proposed amendment to Annex 10, Volume V consequential to the recent publication of the update of DOC 9718, Vol. II. This proposal was circulated to the FSMP for Email coordination with a deadline of October 1.

The meeting appreciated the update.

8.3 IP10 provides a summary of, and invites industry to provide inputs on, the contents of the Innovation, Science and Economic Development Canada (ISED) notice seeking comments regarding an application by Ligado Networks (Canada) Inc. (Ligado Canada) for authority to provide Ancillary Terrestrial Component (ATC) mobile services over a portion of its licensed Mobile Satellite Services (MSS) spectrum in the L-band (1526-1536 MHz in the MSS downlink, and 1627.5-1637.5 MHz and 1646.5-1656.5 MHz in the MSS uplink). The paper noted that in a similar proceeding in the United States, the aviation industry expressed strong concerns with Ligado's change to the usage of its spectrum from satellite to also providing terrestrial due to concerns with interference to GPS and satellite safety systems, and that the proposal for Canada was for significantly higher power. The meeting appreciated the information.

8.4 To assist in the discussion planned for FSMP/3 (7 September, 2022), the FSMP job cards were reviewed. Based on that review, the meeting made suggested revisions and those will be circulated to the Panel members for their consideration.

9. Date of next meeting and administrative issues

9.1 FMSP-WG/16 is scheduled for [13-24 February][20 February-3 March], 2023 in hybrid (in-person plus virtual) format at the ICAO Regional Office in [Bangkok, Thailand][Cairo, Egypt]. It should be noted for virtual participants that the working hours will be the standard 0900-1700 in the local [Bangkok][Cairo] time zone. That meeting will include a Workshop which will be held the first two days. For planning purposes FSMP-WG/17 is tentatively planned for [21 August-1 September][28 August-8 September] at the ICAO Regional Office in [Cairo, Egypt][Bangkok, Thailand] again in a hybrid format and with a Workshop the first two days.

9.2 Due to the pending retirement of FSMP-WG Rapporteur Mr. Mike Biggs, a meeting of FSMP Panel Members was held to select a new Rapporteur. Members agreed on the selection of Mr. Andrew Roy (ASRI) as the new Rapporteur, and Mr. Christian Fleury (France) as the new Vice-Rapporteur.

9.3 The meeting was reminded that as agreed by FSMP-WG/12, papers for FSMP-WG/16 are due one week prior to the meeting. In exceptional circumstances, a framework detailing at minimum the paper summary and introduction will be provided one week prior to the meeting, with the full paper provided no later than one work day before the start of the meeting. Any papers received after this deadline will not be accepted unless agreed by the meeting on the first day. No papers received after the first day of the meeting will be accepted.

APPENDICES

- Appendix A – Agenda
- Appendix B – List of Working Papers, Information Papers and Flimsies
- Appendix C – List of Participants
- Appendix D – Action Item List
- Appendix E – Draft modifications to the ICAO WRC-23 Position
- Appendix F - Draft WAIC SARPS package
- Appendix G – Elements for a proposed Liaison to ECHO project
- Appendix H– Elements for RLS to 5B on NDB parameters
- Appendix I – Elements for RLS to WP5B on WRC-23 agenda item 1.7
- Appendix J – Discussion of ICAO Spectrum Handbook

APPENDIX A**INTERNATIONAL CIVIL AVIATION ORGANIZATION**

**FIFTEENTH WORKING GROUP MEETING OF THE
FREQUENCY SPECTRUM MANAGEMENT PANEL
(FSMP-WG/15)**

(Hybrid meeting, Montréal, QC, Canada, 22 August – 1 September, 2022)

AGENDA

- | | |
|---------------|---|
| Agenda Item 1 | Opening and Working Arrangements <ul style="list-style-type: none"> a) Action Item Review b) Status of tasks identified on Job Cards |
| Agenda Item 2 | ICAO WRC-23 Position <ul style="list-style-type: none"> a) Identified conflicts between administration preliminary proposals and ICAO Position b) Discussion of possible future agenda item proposals from administrations c) Modifications/Updates to the ICAO WRC-23 Position |
| Agenda Item 3 | Development of (planned) Material for ITU-R Studies on: <ul style="list-style-type: none"> a) WRC-23 AI1.6 Suborbital Vehicles b) WRC-23 AI1.7 VHF AMS(R)S c) WRC-23 AI1.8 FSS for UAS d) WRC-23 AI1.9 Wideband HF e) WRC-23 AI1.10 Non-safety AMS f) WRC-23 AI9.2 Radio Regulations clean-up g) Other |
| Agenda Item 4 | Radio Altimeter issues <ul style="list-style-type: none"> b) Report from correspondence group on radio altimeters (CG-RA) a) National efforts to implement broadband mobile near 4200-4400 MHz <ul style="list-style-type: none"> - Mitigation measures - Safety Cases/Compatibility Analyses |
| Agenda Item 5 | 5 GHz Band Planning <ul style="list-style-type: none"> a) AeroMACS b) Global UAS/Remotely Piloted Aircraft Systems (RPAS) channel plan |
| Agenda Item 6 | Interference from Non-Aeronautical Sources <ul style="list-style-type: none"> a) Mobile service communications adjacent to 1518 MHz satellite communications frequency band (see action item 14-04) b) LED lighting systems |
| Agenda Item 7 | Revision of ICAO Frequency Spectrum Handbook (Doc 9718) <ul style="list-style-type: none"> a) Restructure of Volume I b) Update of Volume II |
| Agenda Item 8 | Any Other Business |

APPENDIX B**List of Papers**

“*” papers available on closed website(s)

List of Working Papers

Paper #	Source	Title	Agenda Item
1	M. Biggs	Liaison Statement from ITU-R WP5B on parameters of non-directional beacon (NDB)	3g
2	A.Roy	ICAO frequency coordination process flow and WRC-23 Agenda Item 1.7 (WRC-23)	3b
3	Secretary	Liaison Statement from ITU-R WP5B: Studies on WRC-23 agenda item 1.7	3b
4	Secretary	Liaison Statement from ITU-R WP5B: WRC-23 agenda item 1.6 Regulatory, operational, and technical studies of radiocommunications for suborbital vehicles	3a
5	F. Butsch	Safety aspects of Aeronautical Radiocommunication in the light of provision of ITU	3c
6	M. Biggs	Proposed modifications to the ICAO WRC-23 Position	2c
7	Secretary	Secretariat review of the draft WAIC SARPs	8
8	P. Deedman	IMT-MSS L-band draft ICAO guidelines, provides proposed edits to the text of the draft Guidelines/Information Note attached in Appendix H of the Report from FSMP-WG/12	6a
9	P. Deedman	PROPOSAL TO UPDATE THE ICAO WRC-23 POSITION	2c
10	K. Masrani	L-band MSS frequency use for C2 Link SARPs	5b
11	ENAIRES, Indra and SITA	Proposed position of ICAO on WRC-23 AI 1.7 VHF AMS(R)S for the ITU R CPM	3b
12	ENAIRES, Indra and SITA	ANSP and Airline operational requirements to be supported by Satellite-Based CNS concept	3b
13	ENAIRES, Indra and SITA	SB-VHF technical studies, spectrum sharing and Doppler effect	3b
14	SITA, ENAIRES, and Indra	Space Based VHF Data Link and Terrestrial VHF Data Link co-existence in the 136 – 137 MHz Frequency Band	3b
15	ENAIRES, Indra and SITA	Frequency assignments planning and coordination exercises on AI 1.7 VHF ASMS(R)S	3b
16	ENAIRES, Indra and SITA	Proposed response to the Liaison Statements from ITU-R Working Party 5B on WRC-23 AI 1.7 VHF AMS(R)S	3b
17	J. Mettrop	Current Concerns with the Studies undertaken with Respect to WRC-23 Agenda Item 1.7	3b
18	J. Mettrop	Coordination of Systems Operating in the Aeronautical Mobile Satellite (Route) Service with	3b

		Systems operation in the Aeronautical Mobile (Route) Service within the Frequency Band 117.975-137 MHz	
19	J. Mettrop	Proposed Updates to the Provisions Related to Aeronautical Services in the Radio Regulations under WRC-23 Agenda Item 9.2	3f
20	J. Andre	POTENTIAL SPECTRUM NEEDS FOR SUBORBITAL VEHICLES	3a
21	C.Fleury	EFVS in the Frequency band 31.8-33.4GHz (Ka) and the 95-100GHz (W), The frequency band 31.8-33.4 GHz (32 GHz band) and the 95-100 GHz are allocated to Radionavigation and FIXED services	3g
22	J. Andre	Possible ITU-R coordination for the VHF per satellite	3b
23	A.Roy	UPDATES TO ICAO WRC-23 POSITION	2c
24	C.N. Yeo, H. Foo, J. Chong and M. Kelly	COORDINATION OF VHF FREQUENCY ASSIGNMENTS IN APAC REGION	3b

List of Information Papers, Presentations and Flimsies

Paper #	Source	Topic	Agenda Item
1	F. Butsch	Meeting Report of the NSP SPECTRUM WORKING GROUP (SWG)	8
2	A.Malaga, M. Neale, D. Nellis	Compatible AM(R)S and AMS(R)S operation supporting Remotely Piloted Aircraft Systems in the 5 030-5 091 MHz frequency spectrum	5b
3	S. Futatsumori	Radio altimeter interference susceptibility test results at Japanese Sub-6 5G frequency conditions	4
4	ENAIRE, Indra and SITA	Sharing Studies and operation for Space-based VHF Communications in the 117.975 to 137 MHz Frequency Band	3b
5	ENAIRE on behalf of CG-SV group	Questions and Answers (Q&As) regarding the AMS(R)S (Aeronautical Mobile Satellite (R) Services) concept	3b
6	N. Moulin	Progress of EFVS works in the 32Ghz band	3g
7	N. Shrout	Comparative Performance Review of C-Band Receivers	4
8	C.Fleury	Report from the CG-RA	4a
9	Secretary	ICAO MID Draft Guidance on Safeguarding measures to protect Radio Altimeter from potential harmful interference from Cellular 5G Communications	4
10	J. Cramer	Ligado Request for Ancillary Terrestrial Component Authority in Canada	8

PRESENTATIONS			
1		For IP02	5b
2		For IP04	3b

FLIMSIES			
1	Meeting	Proposed modifications to the ICAO WRC-23 Position	2c
2	C. Tourigny	Elements for RLS to WP5B on AI1.7	3b
3	M. Biggs	Elements for RLS to WP5B on NDBs	3g
4	M. Biggs	Proposed disposition of action items	8
5	J. Andre	Elements for LS to project ECHO	3a
6	A.Roy	Spectrum Handbook updating	7

APPENDIX C**Fifteenth meeting of the Working Group of the Frequency Spectrum Management Panel (FSMP-WG/15)**

Montreal, Canada, 22 August – 1 September, 2022

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-END-

APPENDIX D**ACTION ITEM LIST**

Number	Description	Actionee	Due Date	Status
03-03	Provide comment on the spectrum sharing approach between terrestrial and satellite RPAS C2 systems for the 5 030-5 091 MHz as proposed in FSMP-WG/3 WP10 and FSMP-WG/4 WP17	All	FSMP-WG/15	Ongoing FSMP-WG/12 IP01 and WP11 provide status information CLOSE - ongoing
04-05	Provide input to complete the equipment physical characteristics (e.g., weight) table shown in the Annex of FSMP-WG4/WP26.	All	FSMP-WG15	CLOSE – no contributions
04-06	With regard to the action to “Conduct an aircraft fleet equipage impact analysis and develop detailed transition plans based on industry input and expected safety benefit” in the radio altimeter job card, initiate outreach to the airlines and aircraft manufacturers.	IATA and ICCAIA	FSMP-WG15	Ongoing CLOSE – no contributions
05-06	Explore restructuring of Doc 9718 Volume 1.	Secretary/A. Roy/correspondence group	2022 (complete)	FSMP-WG/12 WP05 provides updates CLOSE – on agenda

09-05	Provide material for the relevant structures specified in WG/09 WP17 and WP20 to the spectrum handbook correspondence group before the next FSMP meeting.	All	FSMP-WG/15	CLOSE – on agenda
09-06	Review system characteristics structure in WG/09 WP20, and provide necessary system information to complete the section for each system.	K. Masrani (Inmarsat), D. Ladson (Iridium), U. Schwark (WAIC), A. Roy (HF and VHF), and Secretary (for other panels to review)	FSMP-WG/15	Partially addressed by FSMP-WG/10 WP14, FMSP-WG/11 WP25. CLOSE – part of standing handbook agenda item
09-09	Provide updated/expanded example outlining the approach for aviation system protection suggested in FSMP-WG/2 WP24.	J. Mettrop	FSMP-WG/15	CLOSE – no contributions
09-10	Provide comparison of aviation system emission masks with respect to relevant ITU requirements.	J. Mettrop	FSMP-WG/16	FSMP-WG/12 WP18 and WP19 & FSMP-WG/13 WP10 and WP12 provide information
10-01	Catalogue aviation concerns with the current language in Resolution 155 (Rev. WRC-19). Participants to send their email address to John Mettrop (john.mettrop@caa.co.uk) by 28 August, 2020 if they want to be part of the FSMP correspondence group.	All	FSMP-WG/15	Termed the group CG-155. FSMP-WG/12 WP13 progressed questions to help delineate ITU tasks from tasks for ICAO/Administration CLOSE – no contributions, on agenda

10-02	Provide comments on increased role for ICAO proposed in the longer-term HF frequency coordination approach contained in FSMP-WG/10 WP17.	All	FSMP-WG/16	CLOSE – no contributions received
10-03	Report on current use in States of the 1300-1350 MHz frequency band for radars and longer term plans.	All	FSMP-WG/16	Potential to be WRC-27 AI band so there is some urgency to this. Put on agenda?
10-06	Provide contributions describing how ultrawideband systems are being authorized in your State.	All	FSMP-WG/15	FSMP-WG/11 IP01 CLOSE – no contributions
10-07	Monitor ITU-R WP5A deliberations on radiocommunications systems for train and trackside (RSTT) as frequency bands being considered are adjacent to those used by aeronautical safety systems	All	Ongoing	CLOSE – no contributions
10-08	Develop contributions on how to ensure protection of aeronautical systems that are not included in the ITU MIFR.	All	FSMP-WG/16	
11-04	Participate in the radio altimeter correspondence group (CG-RA)	All	Ongoing	Send Email to christian.fleury@aviation-civile.gouv.fr
11-05	Participate in ITU-R WP 3K-3M-9 correspondence group which is modelling air-ground propagation paths	All	Ongoing	CLOSE – no contributions received

11-06	Consider RPAS use of more than just the “2x10 MHz” for AMS(R)S communications in the 1.5/1.6 GHz L-Band	All	FSMP-WG/15	CLOSE – FSMP-WG/15 WP10
11-08	Review Recommendation ITU-R SM.1535 and determine if updates are required	All	FSMP-WG/15	Noted that any identified changes should be input to ITU-R by State(s) and not ICAO. CLOSE – no contributions
12-02	Provide comments and updates to the national power levels contained in Figure 1 of FSMP-WG/12 WP17 to Sai.Kalyanaraman@collins.com	All	ASAP	CLOSE – no contributions
12-03	Provide contributions to FSMP-WG/13 regarding the proposals on SM.1541 contained in FSMP-WG/12 WP18	All	ASAP to author or to FSMP-WG/15	FSMP-WG/13 WP09 applies CLOSE – no contributions
12-04	Provide contributions to FSMP-WG/13 regarding the proposals on adding SARPS spectral characteristics requirements contained in FSMP-WG/12 WP19	All	ASAP to author or to FSMP-WG/15	CLOSE – no contributions
12-06	Provide contributions to WG/13 to further develop and answer outstanding questions on the aviation RF sharing framework in Flimsy08	All	FSMP-WG/15	CLOSE – no contributions

12-07	Provide contributions to WG/13 to provide material on a methodology to develop aviation system protection criteria and spectral masks.	All, Lead: J. Mettrop	FSMP-WG/15	CLOSE – part of standing handbook agenda item
12-08	Review and provide comments on the “ITU Res 155 tasks” material contained in Appendix G to the report of FSMP-WG/12.	All	FSMP-WG/15	CLOSE – on agenda
12-09	Review the text of the Job Card FSMP-006-001 and determine if changes are needed..	All	FSMP-WG/15	CLOSE – no contributions
12-10	Determine if generic guidance can be developed to help aviation authorities analyse potential 5G impacts on radio altimeters given their specific State implementation		FSMP-WG/16	FSMP-WG/15 IP09 applies
13-01	Provide examples of national specifications or regulations on adjacent-band signal rejection.	FSMP participants who are also spectrum regulators in their country	FSMP-WG/16	
13-02	Develop repository on the FSMP website for storage of reference material on 5G/Radio altimeter issue	Secretary	ASAP or by FSMP-WG/15	CLOSED
13-03	Develop educational material for States explaining the 5G/RA issue.	CG-RA	FSMP-WG/16	Similar to 12-10, combine? IP09 applies

13-04	Develop a set of frequently asked questions (FAQs) regarding satellite-VHF.	CG-SV	ongoing	To be part of the CG-SV send an Email to the coordinators at: mangarcia@enaire.es and olivier.pellay@airbus.com FSMP-WG/15 IP05 applies
13-05	Catalog existing aviation system transmit and receive masks	J. Mettrop	FSMP-WG/15	CLOSE – part of standing handbook agenda item
14-01	Liaise the draft WAIC SARPS material to the ICAO NSP and CP	Secretary	ASAP so any concerns can be addressed at FSMP-WG/15	CLOSED FSMP-WG/15 WP07
14-02	Consider the proposed Note for the RPAS C2 link SARPS as contained in FSMP-WG/14 WP07 in order to resolve at FSMP-WG/15.	All	FSMP-WG/15	CLOSE, deadline is past. States can comment on the SARPS
14-03	Liaise FSMP-WG/14 WP06 to RPASP WG3 to solicit input to the under-development ITU-R Handbook on detect and avoid systems	Secretary	ASAP	FSMP Liaison was sent, waiting on response
14-04	Participate in CG-MSS to complete the Note providing information on ensuring compatibility between IMT operated below 1518 MHz and aeronautical MSS services above 1525 MHz.	All	FSMP-WG/16	To participate send an email to Kamlesh.Masrani@inmarsat.com FSMP-WG/15 WP08

14-05	Material on proposed coordination approach for new AMS(R)S under WRC-23 1.7. Include proposed liaison to WP5B on the approach.	All	FSMP-WG/15	CLOSED FSMP-WG/15 Flimsy 2
14-06	Review proposal from SP captured in FSMP-WG/14 WP19 and provide comments as necessary.	All	By 11 May 2022 to author (chris.tou rigny@fa a.gov)	CLOSED
15-01	Review the material in IP09 and provide any necessary updates.	All	ASAP to allow incorporation in published version.	
15-02	Bring specific proposals for the ICAO Position on WRC-23 AI9.2 to FSMP-WG/16	All	FSMP-WG/16	

APPENDIX E

Draft modifications to the ICAO WRC-23 Position



FSMP-WG15-Flimsy01
ICAO WRC-23 Positior

APPENDIX F

Draft WAIC SARPS package



FSMP-WG15-WP07_
WAIC-SARPs-editorial

APPENDIX G

Elements for a proposed Liaison to ECHO project



FSMP-WG15-Flimsy05
_LS to ECHO project S

APPENDIX H

Elements for RLS to 5B on NDB parameters



FSMP-WG15-Flimsy03
RLS WP5B on NDB pa

APPENDIX I

Elements for a RLS to WP5B on WRC-23 agenda item 1.7



FSMP-WG15-Flimsy02
_RLS_from ICAO to_WI

APPENDIX J

Discussion of ICAO Spectrum Handbook



Handbook
Planning.docx
