



International Civil Aviation Organization

FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

FIRST MEETING

Montréal, 24 – 25 August 2015

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/1-WP/1
25/8/15

FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

FIRST MEETING

Headquarters, 24 to 25 August 2015

GENERAL

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

**FIRST MEETING OF THE
FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)
(2015)**

LETTER OF TRANSMITTAL

To: President, Air Navigation Commission

From: Chairman, Frequency Spectrum Management Panel
(FSMP) (2015)

I have the honour to submit the report of the first meeting of the
Frequency Spectrum Management Panel (FSMP) which was
held in Headquarters, from 24 to 25 August 2015



Michael Biggs
Chairman

Montréal, 25 August 2015

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FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

FIRST MEETING

Headquarters, 24 to 25 August 2015

HISTORY OF THE MEETING

1. DURATION

1.1 The first meeting of the Frequency Spectrum Management Panel (FSMP) was opened by Alexander Korsakov, First Vice-President of the Air Navigation Commission in the ICAO Headquarters, at 0930 hours on 24 August 2015. The meeting ended on 25 August 2015.

2. ATTENDANCE

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

Members	Advisers	Nominated By
D'AMICO, Eddy		Australia
LUIZ DE MATTOS, Geandro	BEZERRA LIMA, Gustavo Erivan	Brazil
TAYLOR, John	JEVTOVIC, Mitch SIM, Dave	Canada
ZHANG, Jia		China, (People's Republic of)
BUTSCH, Felix	MEYER, Dominik	Germany
ZAPPI, Silvio	CARANDENTE, Michele	Italy
TSUNEAKI, Watanabe	TAKAYAMA, Taichi ONO, Fumie TSUJI, Hiroyuki OKOCHI, Hirochi ISHIKAWA, Takako YONEMOTO, Naruto	Japan

OSINGA, Gerlof		Netherlands
GILO, Charlemagne P.		Philippines
MUZYCHENKO Dmitriy Nikolayevich		Russian Federation
	YOSEF, Turki m Abed	Saudi Arabia
	TSHIKALAHA, Taklani Raymond	South Africa
	TELE, Cokisa Lisa	
METTROP, John	PARRY, Stephen	United Kingdom
BIGGS, Michael	NELSEN, John A.	United States
	KERCZEWSKI, Bob	
SOUGUE, Bissa		ASECNA
ROY, Andrew	HUTCHISON, Kris	ASRI
FRAENKEL, Sven	KHATCHERIAN, Raffi	EUROCONTROL
	FRAUCHE, Athayde	IATA
CRAMER, Joseph	PICHAVANT, Claude	ICCAIA
	DE SOUZA, Luis Fernando	
	LIMA DO NASCIMENTO, Hialina	
	CAPEZZUTO, Vincent	
	KOTLER, Scott	
VASSILIEV, Nikolai		ITU
Observers		
NORBJERG, Peter Majgard		Denmark
MORRISON, Felicity		
FLEURY, Christian		France
LIEUTAUD, Eric		
CALINCIUC, Aurelian Sorinel		Romania
MUNRO, Alastair		EUROCAE
MITCHELL, Steve		ICAO

3. OFFICERS AND SECRETARIAT

3.1 Mr. Michael Biggs (United States) and Mr. Andrew Roy (ASRI) were elected Chair and Vice-Chair of the panel respectively for a period of three years. Mr. Loftur Jonasson, Technical Officer (CNS and Frequency Spectrum, Airport Operations and Interoperability Section) 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 24 June 2015.

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 BY THE FIRST VICE-PRESIDENT OF THE AIR NAVIGATION COMMISSION

Ladies and Gentlemen, Good Morning.

On behalf of the President of ANC and the entire ANC, it is my pleasure to welcome all nominated experts from selected States and International Organization representing all regions of the world and their advisers to Montreal and to this First Meeting as a Panel. I believe that you will enjoy Montreal and that the weather will facilitate efficiency of your work.

Radio frequency spectrum is a scarce natural resource with finite capacity and for which demand is constantly increasing. This puts the requirement on aviation to not only efficiently manage the use of aeronautical spectrum allocations on a global basis, but also to coordinate a common view on the evolution of sharing the spectrum resource with other users. Technical Standards and Recommended Practices (SARPs) for communication, navigation and surveillance (CNS) systems need to be developed in a manner which ensures safe yet efficient use of aeronautical frequency spectrum. In order to maintain sufficient access to the frequency spectrum resource, aviation needs to develop, submit and defend a common coordinated view to national frequency spectrum regulatory authorities who manage the resource on a global basis through the quadrennial World Radio communication Conferences (WRC) of the International Telecommunication Union (ITU). (Assembly Resolution A38-6 refers.)

A little bit of history

A restructuring of the expert groups developing ICAO provisions was proposed to ensure that these provisions and the work of the groups are aimed at achieving required outcomes to meet the needs of the evolving aviation system in an efficient and timely manner.

Approximately two years ago the Air Navigation Commission started considering issues in relation to the modernization of its Panels, as was requested by the 12th Air Navigation Conference in 2012. The

AHWG for Panel Modernization has met on an on-going basis to discuss Terms of Reference for the existing and future panels as well as other aspects related to the creation, modification, merger, change or maintenance of a panel.

The Air Navigation Commission (ANC), when reviewing its overall panel work programme in 2013 and 2014, noted that due to the increasing pressure on aeronautical frequency spectrum, work of the ACP WG-F had been on-going for many years and that the group has operated as a de-facto Panel in recent years. In order to solicit a more stable and broad support by qualified aeronautical frequency spectrum experts from States, the Commission *agreed* to elevate the status of WG-F to a Panel.

On 19 June 2014 (196-9), the ANC approved the Terms of Reference for the FSMP. The main objectives of the panel are:

- Develop and maintain SARPs and guidance material to facilitate frequency management of communication, navigation and surveillance systems.
- 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.
- Update proposals to the detailed ICAO Policy on all relevant aeronautical frequency spectrum allocations.

Let me remind you a little bit about the procedures and tools for the Panel activity. First of all I would draw your attention to the new edition of Doc 7984, *Directives for Panels of the Air Navigation Commission*, which was approved by the Council in March 2014. This document was established for the conduct of panel business and has a broad nature and guidance, because the experience has shown that panels are most effective when they carry out their work as informally as practicable.

- 2.5.1 The duty of members is to contribute substantially to the panel's work.
- 2.5.2 Members are *participating in their personal, expert capacity and not acting as representatives of their nominators*. Members should therefore express their professional opinions and not established policies or points of view of a State or an international organization.
- 3.4.4.1 The panel shall elect a chairperson and vice-chairperson from among its members at the commencement of a panel meeting. *The panel shall specify the duration of the term of office*. The panel shall elect or re-elect a chairperson and vice-chairperson at least every three years.

I would also like to mention Doc 8143, *Directives to Divisional-type Air Navigation Meetings and Rules of Procedure for their Conduct*, which contains guidance for the formulation of SARPs proposals. Currently the ANC is developing one additional guidance document which we will call Standards for Standards, with the purpose of harmonizing the development of ICAO provisions in an appropriate manner.

AHWG established by the ANC in coordination with the Secretariat developed an All Panel Website to facilitate the sharing of information between Panels and for the close cooperation and coordination between Panels. The ANC will continuously evaluate the website for further development and improvement

For the future Panel Meetings there is no longer a differentiation between Panel Meetings and Working Group of the Whole Meetings, coming from the history of limited resources being available for language

interpretation services. Requests for interpretation are now decided on a case by case basis, depending on the need of participants and available resources.

One of the main tasks of the first meeting of the FSMP is to complete the preparation of the forthcoming WRC in November, complete administrative arrangements for the future activity of the panel, consider job card proposals and the panel work programme, as well as other frequency issues.

The first scheduled deliverable of the panel, by the end of 2016, will be the development of a coordinated aeronautical position (ICAO Position) for the next ITU WRC in 2019 (WRC-19). Other important tasks to be urgently undertaken by the FSMP include further development of a long-term aeronautical frequency spectrum strategy and development of frequency assignment planning provisions to facilitate the introduction of remotely piloted aircraft into non-segregated airspace.

During the next few days you will consider in Working groups and subgroups the main items of your work programme, and it is expected that you will make significant progress in all your activities.

On behalf of the ANC I would like to express my appreciation for your recent proposal of updates to the ICAO position for the International Telecommunication Union World Radio communication Conference 2015, which was unanimously supported by the ANC during the last session.

You have considerable amount of work to accomplish during the next five days. The Commission is confident that you will complete all your 6 agenda items and achieve the goals established for this meeting.

A debriefing session with the ANC will be scheduled at the end of the meeting on Friday this week. In that session, I would like the elected Chairperson of this meeting to highlight the work accomplished during the meeting, any major challenges you may have identified to the timely progress of your work, as well as proposed future work. You are all invited to participate in the debriefing.

I wish you every success in your deliberations and I declare open the first meeting of the FSMP.

Thank you for your attention.



FSMP/1-WP/1
25/8/15

FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

FIRST MEETING

Headquarters, 24 to 25 August 2015

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: Opening of the meeting

1.1 The first meeting of the Frequency Spectrum Management Panel (FSMP) was opened by Mr. Alexander Korsakov, First Vice-President of the Air Navigation Commission (ANC) (opening speech is reproduced in chapter ii - history of the meeting)

1.2 The meeting was also briefly addressed by the Panel Secretary, Mr. Loftur Jonasson. The Panel Secretary introduced the new FSMP website (<http://www.icao.int/safety/fsmp>), and noted that material from previous meetings of the Aeronautical Communications Panel (ACP) Working Group-F (WG-F), now being taken over by the FSMP would continue to remain available on the ACP website (<http://www.icao.int/safety/acp>). The Secretary noted also that, in keeping with the previous practices of disseminating early awareness of aeronautical spectrum deliberations to other interested parties inside as well as outside of aviation, the new FSMP website is open to the public. However, also noting that from time-to-time, certain documentation of sensitive nature would need to be restricted, certain elements of the FSMP website will be maintained behind the ICAO Portal access.



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FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

FIRST MEETING

Headquarters, 24 to 25 August 2015

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: Election of Chair and Vice-Chair

2.1 In nominating Mr. Michael Biggs (United States) as the Chair of the Frequency Spectrum Management Panel (FSMP), Mr. Joseph Cramer (ICCAIA) noted his very successful chairing of the ACP WG-F for the last three years. This proposal was seconded by Mr. John Mettrop. The Panel agreed with a clap of hands and welcomed Mr. Biggs as the Chairman of the Panel for a period of three years.

2.2 In nominating Mr. Andrew Roy (ASRI) as the Vice-Chair of the FSMP, Mr. Gerlof Osinga (Netherlands) noted his demonstrated abilities to efficiently conduct meetings within the ITU-R. the nomination was seconded through general agreement by the meeting and the Panel welcomed Mr. Roy as the Vice-Chairman for a period of three years.



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FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

FIRST MEETING

Headquarters, 24 to 25 August 2015

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: Work programme of the FSMP

3.1 In the light of the Terms of Reference for the FSMP as agreed by ANC, in particular the Scope and the Objectives for the work, the group reviewed and made a few minor adjustments to the Draft Job Cards, as previously agreed by ACP WG-F/31 (6 to 10 Oct 2014). The job cards address the following:

1. Maintenance and update of the ICAO frequency spectrum strategy and policy;
2. ITU Radio Regulations (RR) and ITU World Radiocommunication Conferences (WRC) (frequency spectrum access for aeronautical systems);
3. Maintenance of the ITU Radioregulatory framework relevant to aviation and keeping ICAO provisions and the ITU Radioregulatory framework in sync (ITU-R Recommendations and Reports affecting the implementation of aeronautical systems);
4. Radio frequency interference issues for aviation and the need for action by States, ICAO and international organizations; and
5. Development and maintenance of SARPs and guidance material to facilitate frequency management of C, N and S systems.

3.2 The detailed job cards, as amended by the meeting are provided below:

Title	Maintenance and update of the ICAO frequency spectrum strategy and policy				Reference: FSMP001	
Source	FSMP/1					
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 om 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.					
References	Doc 9718 Vol I, Annex 10 Volumes I, III, IV and V. GANP					Attachments?
WPI No.	Work Programme Item (WPI) Description		Expert Group		Deliverable Document	Delivery Timeline
			Lead	Supporting		
1128	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.		FSMP	CP, NSP, ASP	Spectrum Strategy (Doc 9718, Vol I)	Recurrent / ITU WRC cycle
1128	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.		FSMP	CP, NSP, ASP	Spectrum Policy (Doc 9718, Vol I)	Recurrent / ITU WRC cycle
1128	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.		FSMP		Doc 9718 Vol I	Recurrent / ITU WRC cycle
Issue Date:		Date Assessed by WG/SRP:	Date Approved by ANC:	Session/Meeting	Assigned to CG:	CG Review Date:
						Completion Date:

Title	ITU Radio Regulations (RR) and ITU World Radiocommunication Conferences (WRC)				Reference: FSMP002	
Source	FSMP/1					
Problem Statement	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. 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.					
Specific Details (including impact statements)	The RR are updated through regular ITU WRCs, held every three to four years. 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 safety of life critical applications, or loss of required spectrum resource altogether.					
Expected Benefit	Facilitate access to spectrum to support current and future aviation requirements.					
References	ICAO Position for WRC, Assembly Resolution A38-6, Doc 9718 Vol I, ITU RR, ITU-R Recommendations and Reports.					Attachments?
WPI No.	Work Programme Item (WPI) Description	Expert Group		Deliverable Document	Delivery Timeline	
		Lead	Supporting			
1213 1221	Develop and coordinate, through State review and Council approval, an ICAO Position on the various items on the agenda of an upcoming ITU WRC WPI 1223 & 368 also apply to WRC-15.	FSMP		ICAO Position	Recurrent / ITU WRC cycle	
1216 1218	Develop technical analyses and other input material for meetings of the ITU Radiocommunication Sector (ITU-R) to assist with their WRC preparatory studies. WPI 1223 & 368 also apply to WRC-15.	FSMP		Input material to ITU-R	Recurrent / ITU WRC cycle	
1476 1477	Assist ICAO Secretariat to conduct frequency spectrum workshops in the ICAO Regions	FSMP		WRC prep workshops in the ICAO Regions	Recurrent / ITU WRC cycle	
Issue Date:	Date Assessed by WG/SRP:	Date Approved by ANC:	Session/Meeting	Assigned to CG:	CG Review Date:	Completion Date:

Title	Maintain ITU Radioregulatory framework relevant to aviation and keep ICAO provisions and the ITU Radioregulatory framework in sync	Reference: FSMP003				
Source	FSMP/1					
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. Examples of this include Primary Surveillance Radars and Aeronautical Radio Altimeters.</p> <p>ITU Radioregulatory 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.					
References	Annex 10 Vol I, III, IV, V as well as ITU-R Recommendations and Reports.				Attachments?	
WPI No.	Work Programme Item (WPI) Description	Expert Group		Deliverable Document	Delivery Timeline	
		Lead	Supporting			
1473	Develop input material as required for relevant ITU-R Recommendations and Reports which impact the operation of aeronautical systems.	FSMP	ASP, CP, NSP, RPASP...	Input material to ITU-R	Recurrent / ITU WRC cycle	
1473	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.	FSMP	ASP, CP, NSP, RPASP...	ICAO provisions Input material to ITU-R	Recurrent / ITU WRC cycle	
Issue Date:	Date Assessed by WG/SRP:	Date Approved by ANC:	Session/Meeting	Assigned to CG:	CG Review Date:	Completion Date:

Title		Address radio frequency interference issues for aviation and the need for action by States, ICAO and international organizations together			Reference: FSMP004	
Source		FSMP/1				
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. 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)		Interference free operation of communication, navigation and surveillance systems is required for safe and efficient aeronautical operations				
Expected Benefit		Interference free operation of communication, navigation and surveillance systems				
References		AN-Conf/11, Rec 5/2			Attachments?	
WPI No.	Work Programme Item (WPI) Description		Expert Group		Deliverable Document	Delivery Timeline
			Lead	Supporting		
1215 1217	Increase the awareness of member states concerning interference of various types and possible methods for its resolution		FSMP		Doc 9718 Vol I (interference and its mitigation) Doc 9718 Vol II (assignment planning criteria)	Recurrent / ITU WRC cycle
Issue Date:		Date Assessed by WG/SRP:	Date Approved by ANC:	Session/Meeting	Assigned to CG:	CG Review Date:
						Completion Date:

Title		Develop and maintain SARPs and guidance material to facilitate frequency management of communication, navigation and surveillance systems			Reference: FSMP005	
Source		FSMP/1				
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.				
References		Annex 10, Vol V and Doc 9718 Vol II. Secondary interdependencies: Annex 10 Vol I, III, IV			Attachments?	
WPI No.	Work Programme Item (WPI) Description	Expert Group		Deliverable Document	Delivery Timeline	
		Lead	Supporting			
629 ENB-CNS-2018-3	New provisions to support future aeronautical radiocommunications.	FSMP	ASP, CP, NSP	Annex 10 Vol V (and potentially also Vol's I, III, IV) Doc 9718, Vol II Ed x	2020	
1474	Improve frequency assignment planning criteria for the frequency band 117.975 – 137 MHz	FSMP		Doc 9718, Vol II, Ed 2	2017	
619	Decisions made by WRC-12 enable use of portions of the 5030-5150 MHz band 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	FSMP	CP, RPASP	Annex 10 Vol V (and potentially also Vol's I, III) Doc 9718, Vol II Ed 3	2020	
Issue Date:		Date Assessed by WG/SRP:	Date Approved by ANC:	Session/Meeting	Assigned to CG:	CG Review Date:
						Completion Date:

3.3 Noting that the agenda for the next upcoming World Radiocommunication Conference, WRC-19, will be decided by WRC-15 in November 2015, the panel agreed that in 2016, first priority should be given to the development of an ICAO Position for WRC-19. Along with the development of the ICAO Position, the ICAO Spectrum Strategy should be developed further and updates to the ICAO Spectrum Policy, as consequential to the outcome of WRC-15 should also be developed.

3.4 The Draft Position for WRC-19 should be finalized by 4Q 2016 for review by ANC, followed by review by Contracting States prior to final review by ANC and approval by Council by 3Q 2017.

3.5 Updates to the ICAO Spectrum Strategy (ICAO Doc 9718, Vol I, Chapter 8) and the ICAO Spectrum Policy (ICAO Doc 9718, Vol I, Chapter 7) should be finalized at the same time for review and approval by ANC and Council.

3.6 In order to progress the above tasks, two meetings are foreseen in 2016, the second of which should include a full meeting of the Panel.

3.7 Other specific tasks will be progressed as detailed in the relevant Job Cards.

3.8 One task currently identified in the approved Air Navigation Work Programme as accessible on the ANC Panels website, was noted for deletion as it was not directly related to frequency spectrum access and use:

WPI 628 – Annex 10 – Vol V / amendments related to air navigation security



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FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

FIRST MEETING

Headquarters, 24 to 25 August 2015

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: Structure of the FSMP

4.1 The panel noted the work programme as developed under agenda item 3. In order to progress the work in the most efficient manner possible, the panel agreed to work in a single stream.

4.2 Two to three meetings of the FSMP would be held per quadrennial WRC cycle to progress deliverables such as updates to the ICAO Position for an International Telecommunication Union (ITU) World Radiocommunication Conference (WRC), Spectrum Strategy and Policy as well as potential SARPs proposals. These meetings could be in conjunction with less formal meetings of a WG/FSMP, to progress work not resulting in formal deliverables as those stated above.

4.3 Other meetings would be in the less formal mode of a WG/FSMP, some held in the ICAO Regions, in conjunction with WRC preparatory workshops (as described on Draft Job card FSMP002).

4.4 Panel and WG/FSMP, due to the single stream of the work, will have the same Chairman/Rapporteur

A tentative work plan was agreed as follows:

2016		2017		2018		2019	
Q1	Q3	Q1	Q3	Q1	Q3	Q1	Q3
WG/FSMP	FSMP	WG/FSMP	WG/FSMP	WG/FSM P	WG/FSMP	FSMP	WG/FSMP
ICAO HQ	ICAO HQ	APAC	SAM/CAR -NAM	AFI	MID	ICAO HQ	ICAO HQ



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FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

FIRST MEETING

Headquarters, 24 to 25 August 2015

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: Coordination with other panels

5.1 The panel noted that whenever addressing frequency use or spectrum requirements for communication, navigation or surveillance systems, its work will need to be coordinated closely with the various Panels and expert groups, as appropriate, in particular with the Communications Panel (CP), Navigation Systems Panel (NSP), the Aeronautical Surveillance Panel (ASP) and the Remotely Piloted Aircraft Systems Panel (RPASP).

5.2 In addition, the Panel noted its role to assist the Secretariat with the development of input documentation and views to support the work of Study Groups and Working Parties of the ITU Radiocommunication Sector (ITU-R) and the Regional Telecommunication Bodies.



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FREQUENCY SPECTRUM MANAGEMENT PANEL (FSMP)

FIRST MEETING

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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: Other business

6.1 No issues were identified under this agenda item.

APPENDIX

FREQUENCY AND SPECTRUM MANAGEMENT PANEL (FSMP)

FIRST MEETING OF THE WORKING GROUP OF FSMP

Montreal, Canada
25-28 August, 2015

REPORT

1. Introduction

1.1 The meeting was opened by Mr Loftur Jonasson from the ICAO Secretariat, Montreal and Mr Mike Biggs, the Rapporteur of Working Group FSMP (WG-F). Mr Jonasson acted as the Secretary of the meeting. Following introductions, Mr Biggs welcomed the group and provided introductory remarks, meeting information and housekeeping details. The meeting also provided special welcome to Mr Steve Mitchell, former long time WG-F rapporteur, and Mr Dave Sim, former AMCP Panel member for Canada.

1.2 It was noted that based on the decisions at the first Frequency and Spectrum Management Panel meeting (FSMP/1) this would be the first meeting as Working Group FSMP (WG-FSMP/1).

1.3 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.

1.4 The list of papers submitted for consideration by WG-F is contained in Appendix B. The list of participants is in Appendix C.

1.5 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.

2. Update of agenda in line with FSMP/1 decisions on work programme

2.1 No changes were made.

3. Agenda Item 3 – Aviation Safety Margins

3.1 No contributions were presented on this topic.

4. Agenda Item 4 – Updates to Aviation Frequency Spectrum Strategy

4.1 WP08 contained a set of high-level strategic objectives focused on ensuring spectrum requirements are fully met for currently deployed systems and those under development, together with a set of generic principles and practices designed to support the long-term sustainability of aeronautical spectrum to meet all potential future needs in a changing environment. The meeting appreciated the briefing and suggested the material be used to suggest specific changes to the existing ICAO Spectrum Strategy (Doc 9718, Volume I, Chapter 8) for discussion at the next WG-FSMP meeting (Action 01-2).

5. Agenda Item 5 – RF Handbook Volume II (Doc 9718 Vol II), Frequency Assignment Planning

5.1 No contributions were provided on this agenda item.

6. Agenda Item 6 – 5 GHz Band Planning

6.1 WP04 presented that Working Group – S (Surface) of the Communications Panel had recently completed work on SARPS for an Aeronautical Mobile Airport Communications System (AeroMACS) which will provide broadband datalink communication on the airport surface. AeroMACS will operate in aeronautical spectrum in the C-Band. Detailed provisions on the utilization of this spectrum are provided in a draft manual, which was an attachment to the paper. WG-S requested that WG-FSMP review the provisions regarding the use of C-Band spectrum, and in particular sections 1.4.1, 2.3.2, 2.6, 2.7 and 3.1. (Action 01-4)

6.2 WP03 introduced WG-FSMP to a paper presented at the Communications Panel WG-S in June 2015 on Regulatory and Licensing Considerations for AeroMACS. It was stated that although not all of the information was relevant to WG-FSMP, provided additional context to the presentation of the AeroMACS technical manual.

6.3 IP11 reported on the results of studies regarding two actions; identifying the performance degradation of AeroMACS with narrow band interference signals such as continuous wave (CW), and considering the impact of aeronautical mobile telemetry (AMT). Regarding the first task, based on measurements, AeroMACS can continue the communication with 20 dB higher CW interference than desired signal level, with degradation starting with undesired/desired signal ratios around 10 dB. Regarding AMT, the paper reported on AMT characteristics for systems used in Europe, and noted that results of testing should be available by the next meeting.

6.4 IP12 reported that EUROCAE WG73 (Unmanned Airborne Systems) consists of three “focus groups”: SG1 –airworthiness; SG2 –operations; and SG3 –communications (C2, C3), security and spectrum. The paper presented an update on WG73’s overall activities in general, and in particular, described work by SG3 on 5GHz band-planning and related issues. The meeting noted with interest the notional band plan for 5030 - 5091 MHz and the forward and reverse link assumed channel bandwidths (37.5 - 50 KHz and 300 KHz respectively). The presenter agreed to provide notional characteristics for the line-of-sight (LOS) and beyond-LOS (BLOS) systems to be used to begin investigating adjacent channel compatibility with AeroMACS in 5091 - 5150 MHz. (Action 01-5)

7. Agenda Item 7 – Finalize preparations for ITU WRC-15 (identify potential issues/mitigations)**7.1 WRC-15 Agenda Item 1.1**

7.1.1 WP11 provided the meeting with some outcomes of the African preparatory meetings for WRC-15 pertaining to aeronautical agenda items, and particularly on agenda item 1.1, 9.1.5 and 10 and to call for support from the meeting to ensure regulatory measures to protect the operation of VSATs used for the transmission of aeronautical and meteorological information in the 3 400 – 4 200 MHz frequency band. After discussion the meeting agreed that it would be good to highlight the issue of IMT interference to VSAT by including it as a “Special Case” in Document 9718, Section 9.5. (Action 01-1)

7.2 WRC-15 Agenda Item 1.5

7.2.1 WP06 investigated the regulatory status of the proposed use of the fixed satellite service for remotely piloted aircraft command and non-payload communication. It also proposed an alternative method using an aeronautical mobile satellite (R) service (AMS(R)S) allocation for the UAS; which is formally outside of the scope of the agenda item but might be discussed at the WRC. During discussion questions were raised regarding several points in the paper, as well as noting that compatibility with terrestrial services had not yet been addressed in the proposed Resolution.

7.2.2 IP07 offered another approach toward addressing AI 1.5; the approach adopted as an Inter-American Proposal (IAP) in the recent meeting of member states of the Inter-American Telecommunications Commission (CITEL). That approach, based on improvements to Method A1 of the Conference Preparatory Meeting (CPM) manual, was introduced and discussed. A number of questions were raised, primarily regarding compatibility with incumbent terrestrial services.

7.2.3 The meeting noted that both proposals appeared to work from the premise that the technical compatibility issues had been resolved, and that the primary difference appeared to be regarding the approach to address the issue of having fixed satellite service communicate with mobile platforms. Neither approach was endorsed, however the meeting did get good insight into the details of each of the proposals.

7.3 WRC-15 Agenda Item 9.1 (sub-item 5):

7.3.1 WP12 provided the meeting with some feedback regarding African regional preparatory meetings for WRC-15 pertaining to aeronautical agenda item 9.1.5 and requested continued support from the meeting to ensure regulatory measures for protection of Fixed Satellite Services used for the transmission of aeronautical and meteorological information in the 3 400 – 4 200 MHz frequency band. The meeting noted the efforts in the African region, and during discussion found that from regional views there seemed to be global support for no-change (i.e., no allocation to support IMT) in the 3.8-4.2 GHz band. In 3.4-3.8 GHz however, plans differed across various regional groups. In addition, the meeting was informed that the ITU Radiocommunication Bureau is working with administrations to register earth stations in the Caribbean region. That registration will aid in protection of those stations from interference.

7.4 WRC-15 Global Flight Tracking (GFT) for Civil Aviation (PP-14 Res 185, Busan 2014)

7.4.1 The papers described in sections 7.4.2-7.4.7 below were all presented with limited discussion, and then the meeting considered the overall issue of GFT/ Global Aeronautical Distress and Safety System (GADSS) as a whole.

7.4.2 IP06 provided information on the UK CAA view with respect to the WRC agenda item on global flight tracking for civil aviation concluding that there was no need for any action at WRC-15. This conclusion was based on the belief that GFT as currently defined in ICAO does not require a safety allocation, and that space based ADS-B for ATC is a separate issue and not part of the WRC-15 GFT agenda item. Additionally, the paper argued, as far as space based ADS-B for air traffic control (ATC) is concerned, there was not a strong enough requirement for action prior to WRC-19 that would justify risking UK CAA reputation damage. Instead, the UK CAA support the inclusion of the space based ADS-B issue for ATC as part of a future agenda item for WRC-19 to address GADSS. Finally, the paper suggested that the concept of using space-based ADS-B for ATC had been known in 2010, and questioned why a WRC-15 agenda item for that topic had not been sought at WRC-12, a question further raised in the discussion. Nobody present at the meeting could answer the question.

7.4.3 IP02 provided information on the current required communication, navigation and surveillance performance requirements that are applicable for the planned trials for 30 NM and proposed 15 NM satellite ADS-B enabled separation minima in airspace where radar is not available. The conclusion of the paper was that current requirements would require conformance to tighter standards than those being used for the 30 NM trials or convincing evidence as to why the current requirements are applicable. The paper also questioned whether a tighter separation standard would be in operation before 2019. During discussion, the meeting was informed that the ICAO Separation and Airspace Safety Panel (SASP) has already initiated development of ATC standards and procedures specifically dependent on space based ADS-B technology. The work, as approved by the ANC and described in the SASP11 job card, plans for space based ADS-B dependent separation minima to be identified and targeted for publication in PANS-ATM for November 2018. In response to a question from the meeting, it was reported that it has been presumed by SASP that ATC, given the nature of its work and the facilities by which coordination activities are enabled, would manage any contribute to Global Tracking function provided through using space based ADS-B surveillance. Finally the meeting asked the author whether any consultation or coordination was conducted with the SASP prior to submitting the IP and it was confirmed that while the paper had been discussed internally within the UK CAA, no pre-coordination with SASP took place. The Secretary was asked to liaise the paper to SASP for their consideration as necessary.

7.4.4 WP05 considered the need for globally harmonized spectrum to support transmission of Flight Data from aircraft operating in remote regions in the context of GADSS and the 37th ICAO Assembly Recommendation, and requested consideration by WG-FSMP that currently available AMS(R)S spectrum could be used to support this type of service. During discussion by the meeting, questions were raised as to the amount of bandwidth required, how often messages would be sent, and whether they would be transmitted on a routine basis or only triggered by emergency events. The meeting concluded that additional information on requirements was needed before informed recommendations could be made.

7.4.5 WP01 proposed specific text for a draft Resolution for a future (WRC-19) agenda item on GADSS, including text addressing a possible AMS(R)S allocation to support satellite reception of ADS-B as a backup in case it was not addressed at WRC-15.

7.4.6 WP07 presented text for a WRC-19 Agenda Item to address the evolving development by ICAO of some elements of the GADSS that may require amendment of the ITU Radio Regulations. It was noted that the text was identical to the recently approved CITELE GADSS IAP, and was intended to be considered in concert with a WRC-15 allocation for AMS(R)S to support satellite reception of ADS-B as contained in IP09.

7.4.7 IP09 presented the CITELE IAP on GFT, providing a method to achieve an AMS(R)S allocation at WRC-15 in support of satellite reception of ADS-B.

7.4.8 The meeting had considerable discussion on the issues and approaches raised regarding GFT and GADSS. In general, two approaches were presented: AMS(R)S at WRC-15 and GADSS at WRC-19, or all at WRC-19. It was also suggested that aviation could press for the first, and reserve the second as a fallback. In the end however, the meeting could not agree on the best approach.

7.5 WRC-15 Agenda Item 10 (Future WRC agenda items) – Since GADSS was included in the GFT discussions (see Section 7.4 above), there were no contributions for this agenda item.

7.6 Other issues

7.6.1 IP08 presented the CITELE IAP for WRC-15 Agenda Item 1.18. In particular it was noted that the formulation would support the ICAO Position in that it would allow for use of the radars by taxiing aircraft on an advisory basis.

7.6.2 IP13 presented the CITELE IAP for WRC-15 Agenda Item 1.17. It was noted that the approach was identical to that of the single method in the CPM text, which should help facilitate swift resolution at WRC-15.

7.6.3 IP03 presented the IATA WRC-15 Position. The Position was consistent with the ICAO WRC-15 Position, but augmented in some cases to take into account that in the past, aviation has been able to defend its spectrum allocation primarily on safety reasons, but those arguments are perceived as less convincing by non-aviation sectors, for which economic considerations are increasingly used as a basis for decision making instead of safety of flight.

8. Agenda Item 8: Interference from non-aeronautical sources

8.1 WP02 noted that new wired telecommunication standards being developed in the ITU-T have caused some concern in ITU-R WP 5B about the effects on aviation services in the HF, VHF, and UHF. Although WP 5B has expressed its concerns, it has not had information on existing wired interference cases to fully detail the risks. A consolidated response of interference reports from ICAO would support WP 5B's position, and assist the ITU-T in understanding the interference risks to wireless aviation receivers. IP14 provided a copy of a reply liaison statement from WP5B to ITU-T intended as a "consolidated liaison statement to ensure all involved Study Groups and Working Parties understand the

cautious approach that WP 5B applies when dealing with the safety of life radio communication services under its remit". The meeting accepted an action to document cases of interference from wired systems to aeronautical systems (Action 01-3).

9. Agenda Item 9: Any other business

9.1 IP10 suggested that the task of developing Standards and Recommended Practices (SARPs) for Wireless Avionics Intra-Communications systems operated in the frequency band 4 200 – 4 400 MHz would need to be assigned to the appropriate Panel. Furthermore, the paper argued, ICAO should support creation of an RTCA Special Committee and a EUROCAE Working Group that will subsequently develop a Minimum Operational Performance Standard to provide the means of compliance with the future SARPs. After discussion the meeting agreed we should monitor the WRC-15 outcome and MOPS development and revisit the SARPS issue at a later date.

9.2 IP01 provided an introduction regarding development of a wireless relay communication system using small unmanned aircraft, and some experimental results using the 5GHz band allocated for CNPC links. The meeting was asked to report on their experiences regarding the frequencies used in their countries to support operations of small or medium-sized unmanned aircraft for public or commercial applications.

9.3 IP05 noted that VDL message traffic continues to increase, fuelled by more aircraft, new applications, and next generation digital airframes. In that context, the paper discussed current VDL usage, the growth of this traffic, and options for future VDL growth, including any potential future VDL technologies that may be developed. The paper suggested that lessons learned in the VDL implementation should also be taken into account with other new aviation systems. Efforts up-front to minimize things like unwanted emissions can have huge benefits in the future when those systems are actually fielded.

9.4 WP09 provided examples of the pressures that aviation is under to address national issues and how those pressures can affect the global harmonisation of aeronautical systems and potentially place other administration in difficulty. The meeting agreed that consultation between different regions prior to system introduction/development is certainly preferable and should be encouraged.

9.5 WP10 provided questions about a statement made at WG-F/31 about allowing direct access to the voice switch for pilots of remotely piloted aircraft and asks whether such an option has been fully thought through. The meeting agreed that the correct expertise was within the Remotely Piloted Aircraft Systems Panel (RPASP) and asked the Secretary to pass the paper to that Panel for resolution.

9.6 Presentation 1 provided detail on Air-Ground Channel Characterization based on work that has been accomplished – and briefed to WG-F – over the past few years as part of a NASA project. Theory, measurements and analysis methodology were reviewed, as well as the resulting air-ground channel models that are being developed for L-band and C-band air-ground wideband transmission systems.

9.7 IP04 reports that the long and complex activity to measure and model the characteristics of the air-ground aeronautical channel in the L-Band and C-Band portions of spectrum allocated to aeronautical services is nearing completion. An extensive set of flight tests have resulted in propagation measurement

data collected in the 960-977 MHz and 5030-5091 MHz bands. At this point, path loss models and estimation of stationarity distances for all environments have been completed and examples are provided in the paper. Progress on the development of airframe shadowing models and wideband AG channel models is also reported.

10 Date of next meeting

10.1 The next meeting has been tentatively scheduled for 15-19 February, 2016 in Montreal, Canada. Papers for WG-FSMP/2 are due one week prior to the meeting.

For planning purposes, it is noted that the meeting of WG-FSMP/3, to be held in conjunction with a meeting of FSMP/2, is tentatively scheduled for 6-16 September, 2016 in Montreal, Canada.

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 A

**1st Meeting of the Working Group
of the Frequency Spectrum Management Panel (WG-FSMP)
(WG-FSMP/1)
(Montreal, Canada August 25-28, 2015)**

Agenda

1. Opening and working arrangements
2. Update of agenda in line with FSMP/1 decisions on work programme
3. Aviation Safety Margins
4. Updates to Aviation Frequency Spectrum Strategy
5. RF Handbook Volume II (Doc 9718, Vol. II), Frequency Assignment Planning
 - Further development in preparation for a second edition
6. 5 GHz Band Planning
 - AeroMACS status
 - Potential issues coming from RPAS Panel
 - Global UAS/RPAS channel plan
7. Finalize preparations for ITU WRC-15 (identify potential issues/mitigations)
 - WRC-15 Agenda Item 1.1
 - WRC-15 Agenda Item 1.5
 - WRC-15 Agenda Item 9.1 (sub-item 5)
 - WRC-15 Global Flight tracking for Civil Aviation (PP-14 Res 185, Busan 2014)
 - WRC-15 Agenda Item 10 (Future WRC agenda items)
 - Other issues
8. Interference from non-aeronautical sources
9. Any Other Business

APPENDIX B**List of Papers****List of Working Papers**

Paper #	Source	Title	Agenda Item
1	J Mettrop	Future World Radiocommunication Conference Agenda Item for the Global Aeronautical Distress and Safety System	7
2	A Roy	Reporting of Interference from wired telecommunication systems	8
3	A Roy	AeroMACS Licensing and Regulatory Considerations	6
4	Secretary	Draft AeroMACS Manual	6
5	J Taylor	Triggered transmission of FDR/CVR data	7
6	J Mettrop	Use of the Fixed Satellite Service for Remotely Piloted Aircraft Command and Non-Payload Communication	7
7	J Taylor	Future ITU World Radiocommunication Conference Agenda Item to support introduction of the Global Aeronautical Distress and Safety System	7
8	R Khatcherian	Civil Aviation Spectrum Strategy and Vision	4
9	J Mettrop	Harmonized use of Spectrum	9
10	J Mettrop	Access to the Voice Switch for Pilots of Remotely Piloted Aircraft	9
11	B. Sougue	ATU Outcome	7
12	L Tele	Agenda Item 9.1.5	7

List of Information Papers and Flimsies

Paper #	Source	Topic	Agenda Item
1	NICT	Introduction of Development of Wireless Relay Communication System using Small Unmanned Aircraft and Request Information of Allocation of Frequency Band For Unmanned Aircraft Used Locally As Public or Commercial Use.	9
2	J Mettrop	15 NM Separation Minima lateral/longitudinal Communication, Navigation & Surveillance Performance Requirements	7
3	IATA	IATA Position for the ITU WRC-15	7

4	David Matolak, Kurt Shalkhauser and Robert Kerczewski	Latest Results for L-Band/C-Band Air-Ground Channel Measurement and Modeling	9
5	A Roy	VDL Systems: Current Status In the USA and Spectrum Considerations for Potential Future VDL Systems	9
6	J Mettrop	UK CAA View on Global Flight Tracking	7
7	M Biggs	CITEL IAP AI1.5	7
8	M Biggs	CITEL IAP AI1.18	7
9	M Biggs	CITEL IAP AI GFT	7
10	R Zakrzewski	Wireless Avionics Intra-Communications Proposed Standardization Activities	9
11	Naruto Yonemoto, Kazuyuki Morioka, Naoki Kanada, and Yasuto Sumiya	Intermediate report on investigation of 5 GHz interference analysis	6
12	A Munro	5 GHz Band Planning Update	6
13	J Cramer	CITEL IAP AI1.17	7
14	A Roy	Reply Liaison "Evaluating the leakage and impact of radio frequency noise from telecommunication systems using metallic conductors"	8
FLIMSIES			
1	D Sim	Aviation safety systems	

APPENDIX C**First meeting of the Working Group of the Frequency Spectrum Management Panel (WG/FSMP/1)**

Montreal, Canada, 25 to 28 August 2015

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APPENDIX D**ACTION ITEM LIST**

Number	Description	Actionee	Due Date	Status
32-1	Provide J. Taylor with maximum 1090 MHz FRUIT rates for Europe, including reference	J. Mettrop R. Khatcherian	April 2015	Closed
32-2	Provide feedback to R. Khatcherian regarding the draft SESAR vision and strategy.	All	WG-F/33	Closed (see 01-2)
32-3	Review proposed VHF adjacent channel planning criteria contained in WG-F/32 WP11/IP02 in order to allow for a decision on whether to update the Spectrum Handbook.	All	WG-FSMP/2	Still open
32-4	Provide N. Yonemoto with characteristics of 5 GHz aeronautical mobile telemetry (AMT) characteristics to support AeroMACS studies	C. Pichavant	April 2015	Closed
32-5	Consider the issue of interference to radio altimeters as presented in WG-F/32 WP21. Provide input on issues such as: should ICAO develop altimeter standards? What is the best way for ICAO to raise the visibility of the safety issue? Do high intensity radiated field (HIRF) requirements apply to radio systems, and if so, how?	All	WG-FSMP/2	Still open
32-6	Poll internal data bases and compile list of reported interference to radio altimeter systems. Include geographic locations of instances. Also present a paper to the RASG-MID/4 meeting on the issue.	IATA	WG-FSMP/2	Still open
32-7	Provide input to J. Mettrop to support the examination of cost savings from removing a generic avionics box (ref. WG-F/32 IP08)	All	WG-FSMP/2	Still open
32-8	Review the proposal to develop a definition of "aviation safety system" and provide draft inputs as appropriate	All	WG-FSMP/2	Still open. Input provided in WG-FSMP/1 Flimsy 1 for Comm

				systems
32-9	Develop a liaison to WP5B based on the meeting discussion of WG-F/32 WP04	Secretary	May 2015	Closed
01-1	Update Doc 9718, Volume I, Section 9.5 “Special Cases” to include material on VSAT vs IMT.	B. Sougue	WG-FSMP/2	
01-2	Provide redline/strikeout version of Doc 9718, Volume I, Chapter 8 based on the strategy proposed in WG-F/32 WP08	J. Mettrop R. Khatcherian	WG-FSMP/2	
01-3	Provide examples of wired systems causing interference to aviation wireless systems (reference WF-F/32 WP02 and IP14)	All	WG-FSMP/2	
01-4	Review sections 1.4.1, 2.3.2, 2.6, 2.7 and 3.1 of the AeroMACS Manual as contained in WG-FSMP/1 WP04 and provided comments as necessary.	All	ASAP, but not later than WG-FSMP/2	
01-5	Provide notional characteristics for the line-of-sight (LOS) and beyond-LOS (BLOS) RPAS systems to be used to begin investigating adjacent channel compatibility with AeroMACS in 5091-5150 MHz.	A. Munro	WG-FSMP/2	

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