
ICAO
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A UN SPECIALIZED AGENCY
GLOBAL DEVELOPMENTS RELATED TO CNS
RECONNECTING THE WORLD

GLOBAL DEVELOPMENTS RELATED TO CNS

BY CNSS SECTION AND AOI SECTION

Twenty Seventh Meeting of the Communications/

Navigation and Surveillance Sub-group (CNS SG/27)

of APANPIRG

Bangkok, Thailand, 28 August - 1 September 2023

ICAO

Presentation Overview

01 COMMUNICATIONS

02 NAVIGATION

03 SURVEILLANCE

04 SPECTRUM

05 INTEGRATED CNS & SPECTRUM

06 OTHER CNSS ACTIVITIES

COMMUNICATIONS

The 6th meeting of the Data Communication Infrastructure Specific Working Group of the Communications Panel (CP-DCIWG/6) was held 17-20 October 2022. Several deliverables, proposals for amendment to Annex 10 Volume II and Volume III, were provided by CP-DCIWG/6.

- **Provisions on the exchange of information using the aeronautical telecommunication network over the internet protocol suite**

  (SARPS on Aeronautical Telecommunications Network using the Internet Protocol Suite (ATN/IPS) with VOIP)

COMMUNICATIONS

- **Provisions on the exchange of information using the aeronautical telecommunication network over the internet protocol suite**

  (SARPS on Aeronautical Telecommunications Network using the Internet Protocol Suite (ATN/IPS) with VOIP)

An IP-based network for ATM is a key enabler for developments such as SWIM, FF/ICE, TBO and RPAS. However there are complex issues that need to be addressed to ensure network security and mobility across various media. Some of these include stringent performance requirements (especially for A/G); higher availability requirements, accommodation of the ICAO 24-bit aircraft address, a robust network architecture and interfaces, naming conventions unique to aviation.

This PfA, which also includes provisions for VoIP, will facilitate the introduction of global harmonized provisions for consistent and unique addressing, while providing means for the protection from random intrusions.

The Air Navigation Commission (ANC) carried out its preliminary review on 13 June 2023.

COMMUNICATIONS

Proposed amendment to Annex 10, Volume III related to ATN/IPS and consequential amendment to Annex 10, Volume II Cont.

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Tel.: +1 514-954-8219 ext. 6890

Ref.: AN 7/63.1.3, AN 7/64.1.1- 23/59 31 July 2023

Subject: Proposed amendment to Annex 10, Volume III related to ATN/IPS and consequential amendment to Annex 10, Volume II, stemming from the sixth meeting of the Data Communications Infrastructure Working Group of the Communications Panel (CPDCIWG/6)

Action required: Comments to reach Montréal by 31 January 2024

Sir/Madam,

1. I have the honour to inform you that the Air Navigation Commission (ANC), at the sixth meeting of its 223rd Session held on 13 June 2023, considered a proposal developed by the sixth meeting of the Data Communications Infrastructure Working Group of the Communications Panel (CPDCIWG/6) to amend Annex 10 — *Aeronautical Telecommunications*, Volume III — *Communication Systems*, Part I — *Digital Data Communication Systems* and Part II — *Voice Communication Systems*, and consequential amendment to Annex 10, Volume II — *Communication Procedures including those with PANS status*. The Commission authorized its transmission to Member States and appropriate international organizations for comments.

2. The proposal introduces provisions relating to updates to the aeronautical telecommunication network (ATN)/Internet Protocol Suite (IPS) requirements regarding IPS mobility across multiple media, naming and addressing, IPS security, quality of service (QoS), system management and overall transitional aspects.

State Letter (AN 7/63.1.3, AN 7/64.1.1- 23/59) was published on 31 July 2023 and circulated to States and international organizations for their comments.

Due date for comments is 31 January 2024.

The Secretary will present the results of the consultation for a final review by the ANC during its 227th Session (Fall 2024).

The expected applicability date for the PfA is 27 November 2025.

COMMUNICATIONS

- Update SATCOM SARPs

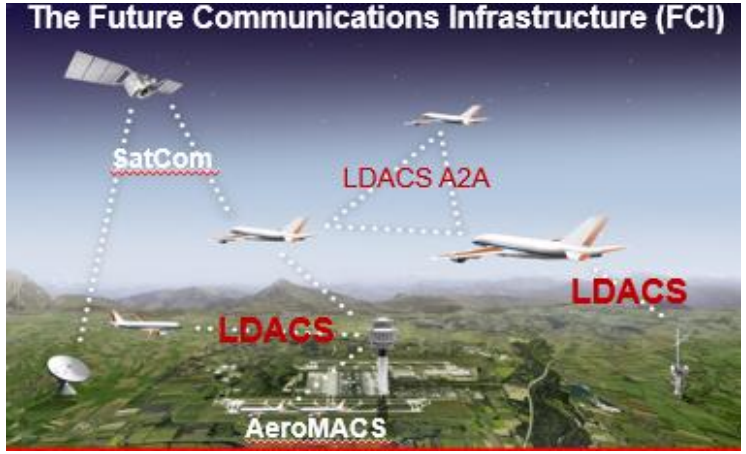
ATM Operations in the ASBU Block 1 and 2 timeframes will require capacity, performance and ease of use that cannot be met by the satellite systems in use today.

New SATCOM systems referred to as SATCOM Performance Class B will offer better overall performance compared to the existing systems, while maintaining continuity with existing legacy ground-based and airborne equipment.

- PfA preliminary review is expected in Q1 2025

COMMUNICATIONS

- SARPS on L-Band Terrestrial Data Link System (LDACS)



Future ATM Operations will require capacity and performance that cannot be met by the terrestrial data link systems in use today.

New operational procedures for ATM, as well as increasing demands for operational and business continuity require greater robustness, resilience and security in air/ground communications systems. These can be realized through the introduction of LDACS.

LDACS, a broadband system based on Orthogonal Frequency-Division Multiplexing (OFDM) like current/future cellular mobile radio standards, applies modern and highly efficient transmission concepts and advanced recover design for interference robustness. LDACS is highly flexible and scalable and, thus, enables long-term evolution. LDACS supports high-rate data communications and voice, which enables important future applications.

- PfA preliminary review is expected in Q1 2025

COMMUNICATIONS

- CP-DCIWG/6 also discussed and approved:

- New editions of Doc 9880 and Doc 9869
- Updates to the CP-DCIWG job cards and
- New job card on Development and standardization of emerging aeronautical communication technologies and systems operating in VHF frequency band

NAVIGATION

Amendment 93 to Annex 10 — Aeronautical Telecommunications, Volume I — Radio Navigation Aids, regarding:

- support of the introduction of dual-frequency, multi-constellation (DFMC) global navigation satellite system (GNSS) by adding provisions for additional frequencies of operation for the global positioning system (GPS), the global navigation satellite system (GLONASS) and the satellite-based augmentation system (SBAS), and by introducing provisions for the new BeiDou Navigation Satellite System (BDS) and Galileo system; and
- support of ionospheric gradient mitigation for the ground-based augmentation system (GBAS).

ICAO NEWS RELEASE

GNSS milestone achieved as ICAO Council adopts new dual-frequency multi-constellation standards

https://www.icao.int/Newsroom/Pages/GNSS-milestone-achieved-as-ICAO-Council-adopts-new-dualfrequency-multiconstellation-standards.aspx

NAVIGATION

- support of the introduction of dual-frequency, multi-constellation (DFMC) global navigation satellite system (GNSS) by adding provisions for additional frequencies of operation for the global positioning system (GPS), the global navigation satellite system (GLONASS) and the satellite-based augmentation system (SBAS), and by introducing provisions for the new BeiDou Navigation Satellite System (BDS) and Galileo system; and
- support of ionospheric gradient mitigation for the ground-based augmentation system (GBAS).

- The proposed amendment arose from the sixth meeting of the Navigation Systems Panel (NSP/6).
- After consultation with States and international organizations and final review by the Air Navigation Commission, the amendment was adopted by the ICAO Council on 20 March 2023.
- It became effective on 31 July 2023 and will be applicable on 2 November 2023.

NAVIGATION

Amendment 93 to Annex 10 — Aeronautical Telecommunications, Volume I — Radio Navigation Aids cont.

Impact on States:

- Implementation of DFMC GNSS (any element) is not mandatory and will be driven by the specific cost/benefit and policy considerations that apply to individual States.
  - For most States that choose to implement DFMC GNSS, no additional infrastructure costs will be involved.
  - For DFMC GNSS provider States (core satellite constellation, SBAS) typically infrastructure costs will not be carried by aviation users given that the related infrastructure is of universal utility and aviation users represent a small fraction of the user community.
- Implementation of the GBAS changes would consist of a minor modification to existing material.

NAVIGATION

Ongoing NAV developments (after Amendment 93):

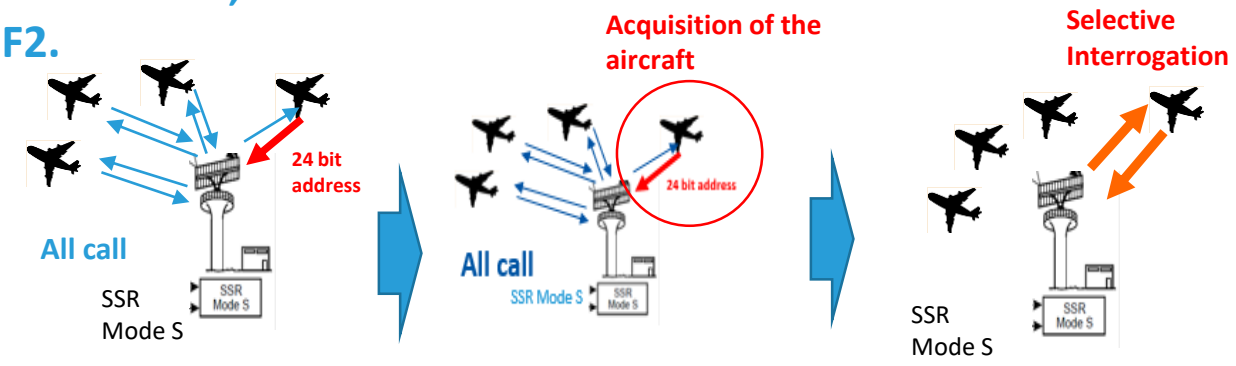
- ARAIM (Advanced RAIM)
- SBAS authentication
- DFMC GBAS
- GNSS interference mitigation
- APNT (alternative position, navigation and timing)

SURVEILLANCE

Proposal for amendments (PfA) to Annex 10, Volume III, related to 24-Bit aircraft address

On 29th Nov 2022, the Air Navigation Commission (ANC) carried out a preliminary review of the PfA to Annex 10, Volume III, related to 24-Bit aircraft address. This PfA includes:

a) refinement of provisions related to aircraft address assignment;
b) increasing State allocation of aircraft addresses; and
c) deletion of unused registers F1 and F2.



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SURVEILLANCE

Proposal for amendments (PfA) to Annex 10, Volume III, related to 24-Bit aircraft address, continued

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Tel.: +1 514-954-8219 ext.6082

Ref.: AN7/1.3.95-22/106 22 December 2022

Subject: Proposed amendments to Annex 10, Volume III, related to 24-Bit aircraft address stemming from the fourth meeting of the Surveillance Panel (SP/4)

Action required: Comments to reach Montréal by 22 June 2023

Sir/Madam,

1. I have the honour to inform you that the Air Navigation Commission, at the sixth meeting of its 221st Session held on 29 November 2022, considered a preliminary review of amendment proposals to Annex 10 — *Aeronautical Telecommunications*, Volume III — *Communication Systems* —arising from the fourth meeting of the Surveillance Panel (SP/4). The Commission authorized the transmission of these proposals to Contracting States and appropriate international organizations for comments.

2. The background for the aforementioned proposals is provided in Attachment A. The proposal for amendments to Annex 10, Volume III is contained in Attachment B. Rationale boxes providing more information have been included, where appropriate, immediately following each proposal.

3. In examining the proposed amendments, you should not feel obliged to comment on editorial aspects as such matters will be addressed by the Air Navigation Commission during its final review of the draft amendments.

4. May I request that any comments you wish to make on the amendment proposals be dispatched to reach me not later than 22 June 2023. To facilitate the processing of replies with substantive comments, I invite you to submit an electronic version in Word format to icaohq@icao.int. The Air Navigation Commission has asked me to specifically indicate that comments received after the due date may not be considered by the Commission and the Council. In this connection, should you anticipate a delay in the receipt of your reply, please let me know in advance of the due date.

5. In addition, the proposed amendments to Annex 10, Volume III are envisaged for applicability on 28 November 2024. Any comments you may have thereon would be appreciated.

999 Robert-Bourassa Boulevard Montréal, Quebec Canada H3C 5H7 Tel.: +1 514-954-8219 Fax: +1 514-954-6077 Email: icaohq@icao.int www.icao.int

State Letter (AN7/1.3.95-22/106) was published on 22 Dec 2022 and circulated to States and international organizations for their comments.

Due date for comments is 22 June 2023.

The Secretary will present the results of the consultation for final review by the ANC during its 224th Session (Fall 2023).

The expected applicability date for the PfA is 28 November 2024.

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SURVEILLANCE

On-going activities

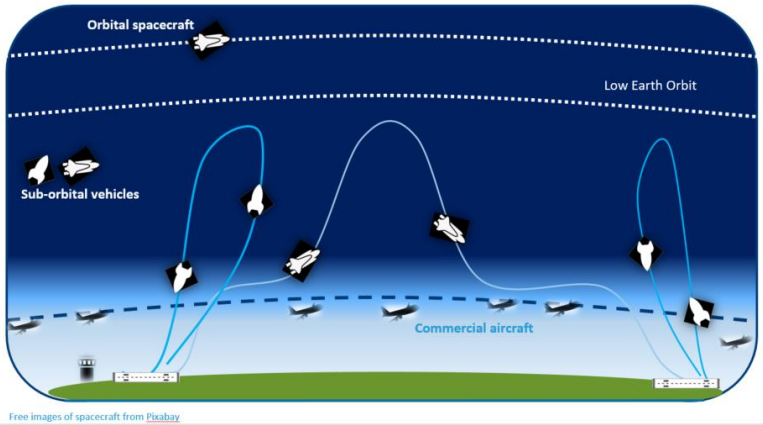
The 5th meeting of the Surveillance Panel (SP/5) to be held 20-29 Sep 2023 is planning to progress a PfA to Annex 10, Volume IV, providing updates to the SSR transponder requirements for compatibility with the new 1090 MHz extended squitter ADS-B version 3 Format.

ADS-B version 3 will provide new capabilities including :

- autonomous distress tracking support
- information to support future interval management operations;
- broadcast of aircraft–based derived weather data;
- Broadcast of lost C2 Link state for UAS/RPAS;
- broadcast of 1030/1090 MHz spectrum monitoring data; and
- functionality to support sub-orbital vehicle operations.

This is related to:

➢ **WRC-23 Agenda item 1.6 and 1.8**



SURVEILLANCE

On-going activities, continued

SP/5 (20-29 Sep 2023) is also planning to progress a PfA to Annex 10, Volume IV:

- to provide technical provisions for **the efficient use of the 1090 MHz radio frequency (RF),** providing means and measurements to reduce 1090 MHz RF congestion, ensuring better performance of surveillance systems and continued use of 1090 MHz systems;

- to introduce ACAS III technical provisions, based on **ACAS Xu** (Unmanned Aircraft System) avionics standards developed by RTCA/EUROCAE; and

- to provide a proposed revision to Chapter 7 of Annex 10 Volume IV, which specifies technical requirements for **airborne surveillance applications utilizing ADS-B IN**.

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FREQUENCY SPECTRUM MANAGEMENT

- **ICAO Position for the International Telecommunication Union (ITU) World Radiocommunication Conference 2023 (WRC-23)**

  - The initial ICAO Position was approved by the ICAO Council and sent to all ICAO Contracting States and relevant international organizations under cover of ICAO State letter(SL) E 3/5-21/37 dated 18 August 2021.

  - The ICAO Council approved updates to the ICAO position on 16 June 2023 and the **final ICAO WRC-23 position** (SL: E 3/5-23/60) was sent out on 19 July 2023 **urging States to apply the ICAO Position to the extent possible in formulating their positions for WRC-23, and to include aviation experts both in the development of said positions, and as part of their national delegations to WRC-23**

  - WRC-23, which will be held 20 Nov-15 Dec this year will be quite busy for aviation. WRC-23 Agenda Items 1.6, 1.7, 1.8, 1.9 and 9.2 address issues where aviation is seeking action by the WRC.

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Tel.: +1 514-954-8219 ext. 7130

Ref.: E 3/5-23/60 19 July 2023

Subject: Updated ICAO Position for the ITU WRC-23

Action required: a) apply the updated ICAO Position to the extent possible when formulating your State's position for the ITU WRC-23; and b) include aviation experts both in the development of said position, and as part of your State's national delegation to the ITU WRC-23, bearing in mind ICAO Assembly Resolution A41-7, operative clause 1.

Many WRC agenda items are directly related to CNS & Spectrum expert activities!

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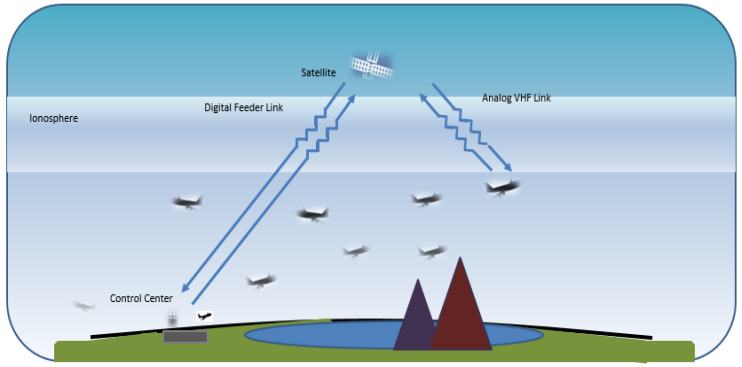
FREQUENCY SPECTRUM MANAGEMENT

- **ICAO Position for the International Telecommunication Union (ITU) World Radiocommunication Conference 2023 (WRC-23)**

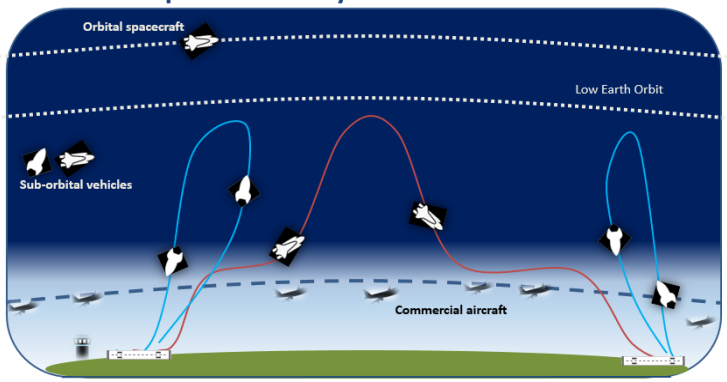
  - Active support from States is deemed to be the only means to ensure that the results of the WRC-23 reflect civil aviation's need for spectrum.

WRC-23 Agenda Item 1.7:
Potential facilitation of aeronautical VHF over satellite



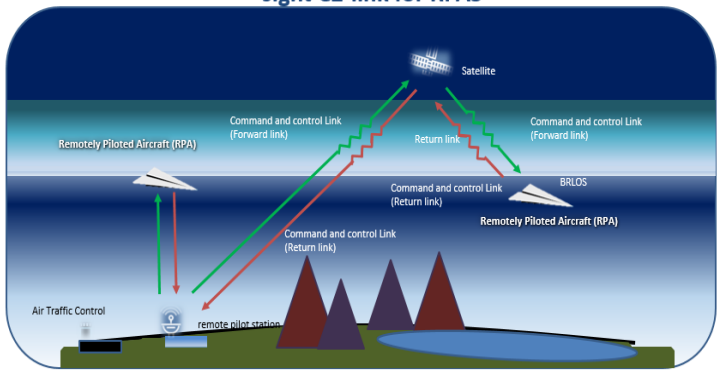
Original image from ICAO CP-DCIWG

WRC-23 Agenda Item 1.6:
Spectrum use by sub-orbital vehicles



Free images of spacecraft from Pixabay

WRC-23 Agenda Item 1.8:
Finalization of a satellite allocation enabling beyond-line-of-sight C2-link for RPAS



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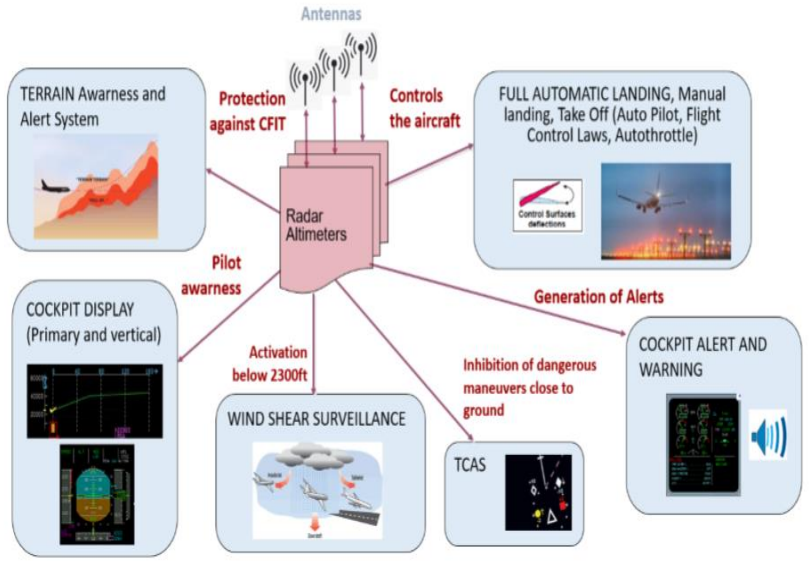
FREQUENCY SPECTRUM MANAGEMENT

Potential interference to Radio Altimeters and development of relevant SARPs

- A number of administrations are currently considering or have already begun deploying new cellular broadband technologies (such as 5G) in the frequency bands close to the radio altimeter's frequency band of operation (4.2-4.4 GHz).

- The international aviation industry has noted with concern that these broadband technologies may cause harmful interference to radio altimeters, which is a mandated critical aircraft safety system used to determine an aircraft's height above terrain. If not properly mitigated, harmful interference to the function of the radio altimeter during any phase of flight may pose a serious safety risk to passengers, crew and people on the ground.



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FREQUENCY SPECTRUM MANAGEMENT

Potential interference to Radio Altimeters and development of relevant SARPs Cont.

- ICAO has received studies from several States and organizations regarding the interference potential to radio altimeters. These studies generally conclude that some radio altimeters will be impacted if high power cellular systems are implemented near the frequency band used by the radio altimeters.

- ICAO published a State Letter (Refer to SP 74/1-21/22, 25 March 2021) which encourages States and the aviation industry to consider as a priority, public and aviation safety when deciding how to enable cellular broadband/5G services in radio frequency bands near the bands used by radio altimeters.

- A41 Outcome related to the ICAO policy on radio frequency spectrum matters: Requested ICAO and its Member States to continue taking necessary measures and efforts to ensure that radio altimeters and other aeronautical systems are free from harmful interference, including implementation of mitigation measures, sharing of best practices, as well as development of relevant provisions and guidance.

Tel.: +1 514-954-8219 ext. 7130 25 March 2021

Ref.: SP 74/1-21/22

Subject: Potential safety concerns regarding interference to radio altimeters

Action required: As indicated in paragraph 5

Sir/Madam,

1. I have the honour to bring your attention to an ongoing initiative by the International Civil Aviation Organization (ICAO) to ensure continued public and aviation safety.

2. During recent meetings of ICAO experts, concerns about interference to radio altimeters on-board aircraft have been raised. A number of administrations are currently considering or have already begun deploying new cellular broadband technologies (such as 5G) in the frequency bands close to the radio altimeter's frequencies of operation (4.2-4.4 GHz), a critical aviation safety system. The international aviation industry has noted with concern that these broadband technologies may cause harmful interference to radio altimeters.

3. The radio altimeter[1] is a mandated critical aircraft safety system used to determine an aircraft's height above terrain. Its information is essential to enable several safety related flight operations and navigation functions on all commercial aircraft as well as a wide range of other civil aircraft. Such functions and systems include terrain awareness, aircraft collision avoidance, wind shear detection, flight controls, and functions to automatically land an aircraft. If not properly mitigated[2], harmful interference to the function of the radio altimeter during any phase of flight may pose a serious safety risk to passengers, crew and people on the ground.

4. ICAO has received studies from several States and organizations regarding the interference potential to radio altimeters[3]. These studies generally conclude that some radio altimeters will be impacted

[1] In some aviation publications it is also known as the radar altimeter or Low Range Radar Altimeter.
[2] General guidance on Interference Protection Considerations can be found in Chapter 9 of the *Handbook on Radio Frequency Spectrum Requirements for Civil Aviation – ICAO spectrum strategy, policy statements and related information* (Doc 9718, Volume I)
[3] Report by RTCA – https://www.icao.int/safety/FSMP/MeetingDocs/FSMP%20WG11/FP/FSMP-WG11-IP07_RTCA_Report.docx

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FREQUENCY SPECTRUM MANAGEMENT

Potential interference to Radio Altimeters and development of relevant SARPs Cont.

Planned ICAO Circular in 2023: Guidance on Safeguarding measures to protect Radio Altimeter from potential harmful interference from Cellular 5G Communications

See:
FSMP WG/16 WP/02 Attachment, available for download at FSMP website

Note.- The draft Circular is based on a document developed in the MID Region, while also including/ accommodating input from FSMP members.

TABLE OF CONTENTS

FREQUENCY SPECTRUM MANAGEMENT

- **Develop and maintain SARPs and guidance to prevent WAIC / Radio Altimeter interference**

  - WRC-15 agreed to changes to the international radio frequency regulations which provide for sharing of the frequency band 4 200 – 4 400 MHz by Wireless Avionics Intra-Communications (WAIC) systems under the aeronautical mobile (route) service, and radio altimeters under the aeronautical radionavigation service.
  - The associated ITU 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.

FREQUENCY SPECTRUM MANAGEMENT

Develop and maintain SARPs and guidance to prevent WAIC / Radio Altimeter interference

- A WAIC System provides wireless communications between points 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.
- FSMP/3 held in September 2022 approved the draft WAIC SARPs, which will prevent interference between WAIC systems and radio altimeters in order to ensure the safe operation of aircraft.
- The Air Navigation Commission carried out its preliminary review on 16 May 2023 and authorised its transmission to Member States and appropriate Int Orgs for comments.
- WAIC SARPs will be included in Chapter 4 of Annex 10, Volume V, under a new section 4.5 dealing with the frequency band 4200-4400 MHz. That section will also accommodate the radio altimeter SARPS once they are completed.

FREQUENCY SPECTRUM MANAGEMENT

Proposed amendment to Annex 10, Volume V related to WAIC Cont.

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Tel.: +1 514-954-8219 ext. 7130

Ref.: AN 7/66.1.1-23/47 1 June 2023

Subject: Proposal for the amendment of Annex 10, Volume V relating to implementation of wireless avionic intra-communications (WAIC) for radiocommunication between two or more aircraft stations located onboard a single aircraft

Action required: Comments to reach Montréal by 1 December 2023

Sir/Madam,

1. I have the honour to inform you that the Air Navigation Commission (ANC), at the third meeting of its 223rd Session held on 16 May 2023, considered a proposal developed by the third meeting of the Frequency Spectrum Management Panel (FSMP/3) to amend Annex 10 — *Aeronautical Telecommunications*, Volume V — *Aeronautical Radio Frequency Spectrum Utilization*. The ANC authorized its transmission to Member States and appropriate international organizations for comments.

2. The proposal introduces provisions relating to the implementation of wireless avionic intra-communications (WAIC) for radiocommunication between two or more aircraft stations located onboard a single aircraft. New definitions related to WAIC in Chapter 1 and new Standards and Recommended Practices (SARPs) in Chapter 4, including a description of radio frequency (RF) characteristics of the WAIC transmitter and the WAIC receiver, are presented in Attachment B.

3. The background of the aforementioned proposal is explained in Attachment A. The proposal for amendment to Annex 10, Volume V is contained in Attachment B. A rationale box providing more information has been included immediately following the proposal.

State Letter (AN 7/66.1.1-23/47) was published on 1 June 2023 and circulated to States and international organizations for their comments.

Due date for comments is 1 December 2023.

The Secretary will present the results of the consultation for final review by the ANC during its 226th Session (Spring 2024).

The expected applicability date for the PfA is 27 November 2025.

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INTEGRATED CNS AND SPECTRUM

(Long Term Evolution of CNS and Spectrum matters)

In addition to the continued engagement in the ITU spectrum management process, aviation also needs to engage in a proactive and long-term evolution of the CNS systems

AN-Conf/13 Recommendation 2.2/1

› ICAO to launch a study on evolving the required CNS and spectrum access strategy in the long term, to ensure that CNS systems remain efficient users of the spectrum resource

› request States to engage in the spectrum regulatory process to ensure the continued necessary access and protection of the safety critical aeronautical CNS systems

The study was initiated in 2020.

This activity is expected to benefit the development of aeronautical CNS systems and their spectrum use in the medium to longer term and eventually the formulation of the ICAO spectrum policy for future WRCs

INTEGRATED CNS AND SPECTRUM

The Global concept for Integrated Communications, Navigation, Surveillance (CNS) and Spectrum

The ICNSS-TF is drafting the **global concept for Integrated Communications, Navigation, Surveillance (CNS) and Spectrum**, which will include the following deliverables:

a) a roadmap of CNSS evolution including a blueprint for CNS systems evolution; and

b) a new and streamlined framework for CNSS standardization which delivers:

Relevant WPs were discussed under the agenda item 31 (Aviation Safety and Air Navigation Standardization) at the 41st Assembly (27 Sep to 7 Oct 2022).

The draft Global Concept for Integrated CNS & Spectrum was shared with States and the aviation community, through the link embedded in the A41-WP/58.

(For more information, refer to the Integrated CNSS project: Pages - Integrated CNSS Project (icao.int))

INTEGRATED CNS AND SPECTRUM

The Global concept for Integrated Communications, Navigation, Surveillance (CNS) and Spectrum Cont.

Feedback received was very positive and lead to the following strong support:

“The Commission reviewed A41-WP/58, presented by the Council, which contained information on progress achieved by the Integrated Communications, Navigation, Surveillance and Spectrum (ICNSS) project.

Noting that the ultimate objective of the ICNSS project was to propose a set of recommendations for endorsement by the next Assembly, the Commission expressed its satisfaction with the efforts underway and encouraged States, international organizations and other stakeholders to support the continued development and implementation of a medium to long-term roadmap for the evolution of ICNSS and a new streamlined framework for communications, navigation, surveillance (CNS) and frequency spectrum standardization”.

OTHER CNSS ACTIVITIES

Refinement of Frequency Finder (FF)

- In order to better support States and ICAO regional offices, ICAO continues to enhance the Frequency Finder tool. The following features have now been implemented:

  Plotting interference contours in the NAV module; and

  A global database for Mode S II/SI code assignments.

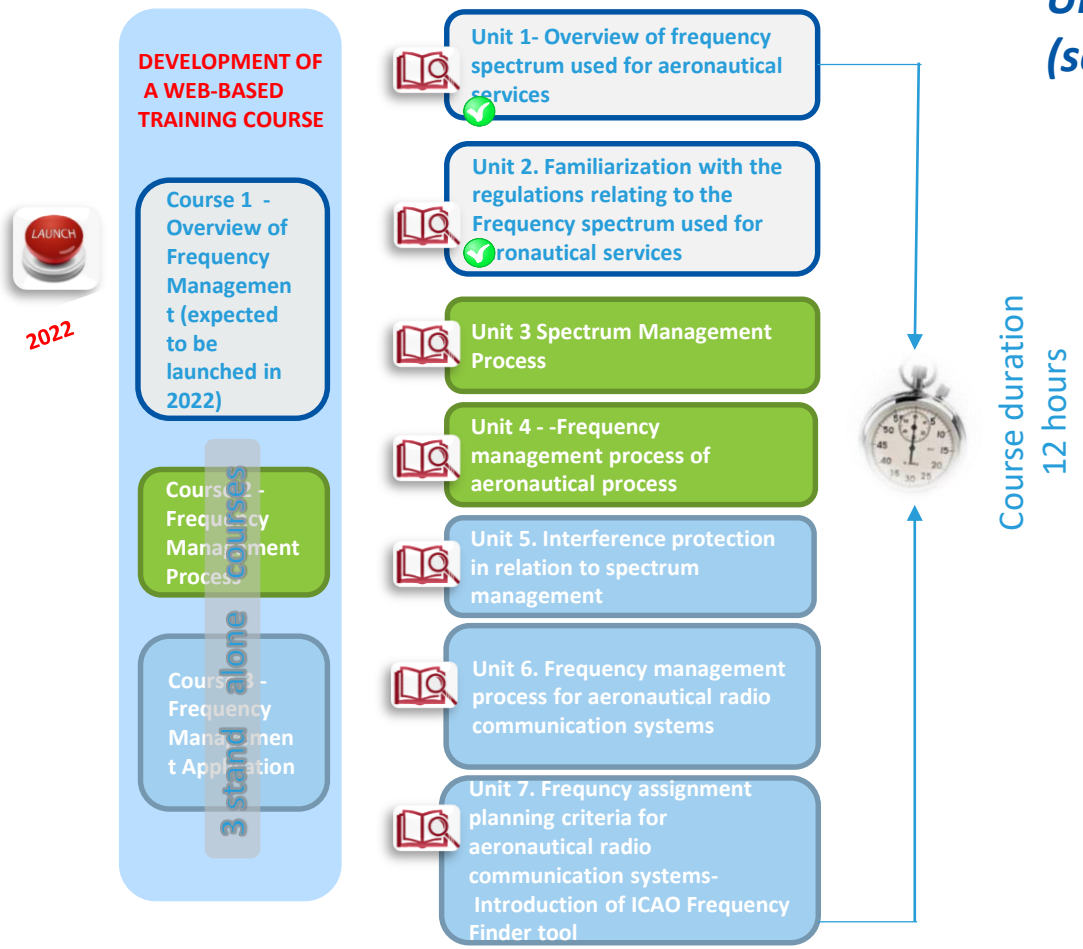
  Several additional enhancements are currently being planned to be developed and implemented (such as adding simulation capability, better cyber resilience of the tool) to facilitate efficient use of spectrum, assisting States and ICAO regional offices to visualize the current and future frequency congestions as well as to identify the optimal spectrum assignment globally and regionally

Workshops to promote Frequency Finder (FF)

- Workshops will continue to be provided to assist States in use of FF

Development of an online course, frequency management for civil aviation (refer to the next slide)

ONLINE COURSE DEVELOPMENT RELATED TO FREQUENCY MANAGEMENT FOR CIVIL AVIATION



Unit 1 was launched in 2022! (see next slide)

Coordination with Global Aviation Training Section

ONLINE COURSE DEVELOPMENT RELATED TO FREQUENCY MANAGEMENT FOR CIVIL AVIATION

Aeronautical Spectrum Use with Special Focus on VHF (ASU) | ICAO Store

Self-paced Training

Aeronautical Spectrum Use with Special Focus on VHF (ASU)

Offered in English only

https://store.icao.int/en/aeronautical-spectrum-use-vhf-special-focus-training

Goal

This course aims to provide the fundamentals of frequency and spectrum management, focusing mainly on Very High Frequency (VHF) used by aeronautical communications systems, as well as a description of the specific terms used in frequency management in civil aviation including a brief discussion about aeronautical communications and navigation systems.

Course Description

The course starts by providing clear explanations of key terms to help you understand Very High Frequency (VHF), in addition to providing an overview of key concepts related to Frequency Management. It further enables you to explore the aeronautical services carried out in VHF and helps you to identify the frequency bands for a wide variety of uses in communications, navigation and surveillance (CNS).

Thank You

ICAO