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GLOBAL DEVELOPMENTS RELATED TO CNS
RECONNECTING THE WORLD

# GLOBAL DEVELOPMENTS RELATED TO CNS

Prepared by CNSS Section & AOI Section, ANB

For the Twenty-Sixth Meeting of the Communications, Navigation, and Surveillance Sub-Group of APANPIRG

CNS SG/26 | 5-9 SEPTEMBER 2022

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*CNSS: Communications, Navigation, Surveillance and Frequency Spectrum Management
AOI: Airport Operations and Infrastructure

# Presentation Overview

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02 NAVIGATION

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# COMMUNICATIONS

The 5th meeting of the Data Communication Infrastructure Specific Working Group of the Communications Panel (CP-DCIWG/5) was held 17-20 May 2022. Several deliverables, proposals for amendment to Annex 10 Volume II and Volume III, are expected from CP-DCIWG/5.

- **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 RPASs and many others. 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. The PfA will assist introduction of global harmonized provisions to make consistent and unique addressing to provide protection from random intrusions.

# COMMUNICATIONS

- Update SATCOM SARPs

ATM Operations in the ASBU Block 1 and 2 timeframe 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 systems, 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 end of this year***

# COMMUNICATIONS

Several deliverables, proposals for amendment to Annex 10 Volume II and Volume III, are expected from CP-DCIWG/5. Cont

- 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. hence new data link systems are required. The development of new ATM operational procedures and increasing demands for operational and business continuity require greater robustness, resilience and security in 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 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.

# COMMUNICATIONS

- Also CP-DCIWG/5 will discuss and approve

- 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

  - Doc 9880: Technical Specifications for ATN using ISO/OSI Standards and Protocols (Part I, II, III, IV)
  - Doc 9869: Performance-based Communicationand Surveillance (PBCS) Manual

# NAVIGATION

Proposed 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).

# 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).
- Consultation with States and international organizations was conducted through State letter AN 7/62.1.4-21/41, dated 6 July 2021, with a due date for replies on 6 January 2022.
- Final review of the proposal by the Air Navigation Commission in light of the results of a consultation with States and international organizations will take place in June 2022.

# NAVIGATION

Proposed 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

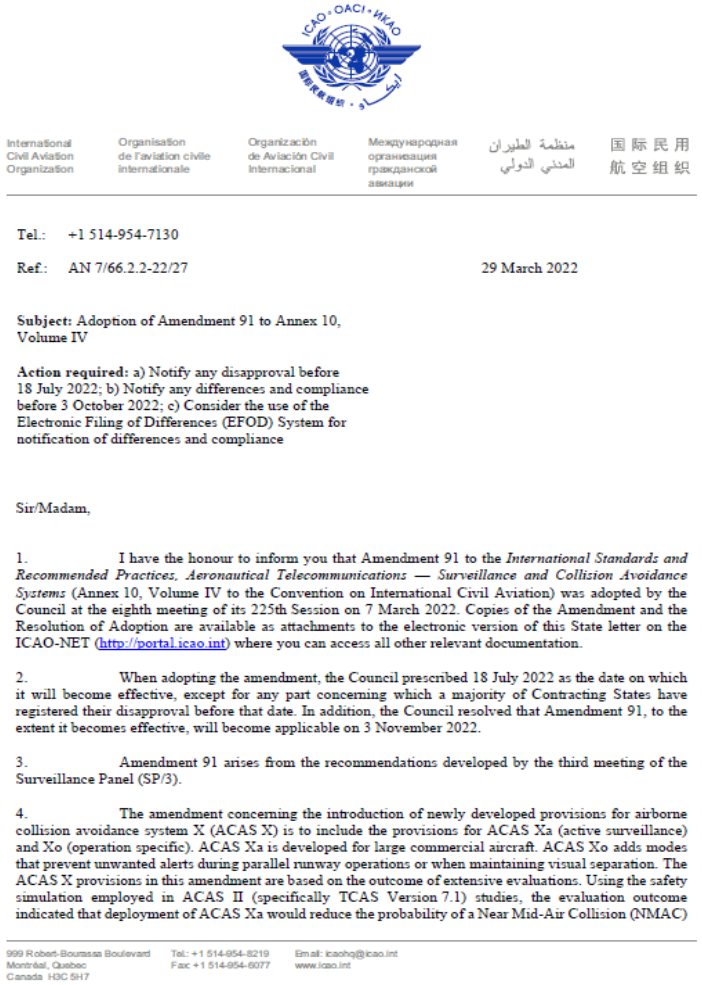
Amendment 91 to Annex 10 Volume IV, regarding introduction of ACAS Xa/Xo.

- Amendment 91 to the International Standards and Recommended Practices, Aeronautical Telecommunications — Surveillance and Collision Avoidance Systems (Annex 10, Volume IV to the Convention on International Civil Aviation) concerns the introduction of newly developed provisions for airborne collision avoidance system X (ACAS X) and a provision to reduce false ACAS alerts.

- The amendment 91 to Annex 10 Volume IV was adopted by the Council at the eighth meeting of its 225th Session on 7 March 2022.

**This will become applicable on 3 November 2022.**

# SURVEILLANCE



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Ref.: AN 7/66.2.2-22/27 29 March 2022

**Subject:** Adoption of Amendment 91 to Annex 10, Volume IV

**Action required:** a) Notify any disapproval before 18 July 2022; b) Notify any differences and compliance before 3 October 2022; c) Consider the use of the Electronic Filing of Differences (EFOD) System for notification of differences and compliance

Sir/Madam,

1. I have the honour to inform you that Amendment 91 to the *International Standards and Recommended Practices, Aeronautical Telecommunications — Surveillance and Collision Avoidance Systems* (Annex 10, Volume IV to the Convention on International Civil Aviation) was adopted by the Council at the eighth meeting of its 225th Session on 7 March 2022. Copies of the Amendment and the Resolution of Adoption are available as attachments to the electronic version of this State letter on the ICAO-NET (http://portal.icao.int) where you can access all other relevant documentation.

2. When adopting the amendment, the Council prescribed 18 July 2022 as the date on which it will become effective, except for any part concerning which a majority of Contracting States have registered their disapproval before that date. In addition, the Council resolved that Amendment 91, to the extent it becomes effective, will become applicable on 3 November 2022.

3. Amendment 91 arises from the recommendations developed by the third meeting of the Surveillance Panel (SP/3).

4. The amendment concerning the introduction of newly developed provisions for airborne collision avoidance system X (ACAS X) is to include the provisions for ACAS Xa (active surveillance) and Xo (operation specific). ACAS Xa is developed for large commercial aircraft. ACAS Xo adds modes that prevent unwanted alerts during parallel runway operations or when maintaining visual separation. The ACAS X provisions in this amendment are based on the outcome of extensive evaluations. Using the safety simulation employed in ACAS II (specifically TCAS Version 7.1) studies, the evaluation outcome indicated that deployment of ACAS Xa would reduce the probability of a Near Mid-Air Collision (NMAC)

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The cost impact for States will be minimal as this simply gives an additional option to implement ACAS II in as mentioned in SL (page 17).

*States that will accept ACAS Xa/Xo-compliant equipment in their airspace and that run an ACAS monitoring program need to update their message interpretation software*

Adobe Acrobat Document

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# SURVEILLANCE

**Amendment Annex 10 Volume III PfA regarding 24-bit aircraft addresses, which was approved by SP4.**

a) 24-bit aircraft addresses assignment;
b) Additional allocation of 24-bit aircraft addresses; and
c) Removal of unused definitions for registers F1 and F2

*PfA preliminary review is expected end of this year*

# SURVEILLANCE

Ongoing activities

Development of PfA to Annex 10 Volume IV relating to

- updates to transponder requirements for compatibility with the new 1090 MHz extended squitter ADS-B version 3 format as detailed in RTCA/EUROCAE avionics standards;

- 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;

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

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

# FREQUENCY SPECTRUM MANAGEMENT

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

  - The 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 E 3/5-21/37 dated 18 August 2021.

  - It looks like the WRC-23, a year and a half from now, will be busier than ever for aviation. WRC-23 Agenda Items 1.6, 1.7, 1.8, 1.9, 1.10 and 9.2 address issues where aviation is seeking action by the WRC.

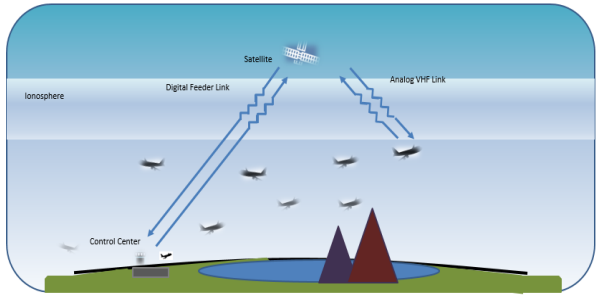
# FREQUENCY SPECTRUM MANAGEMENT

- **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.

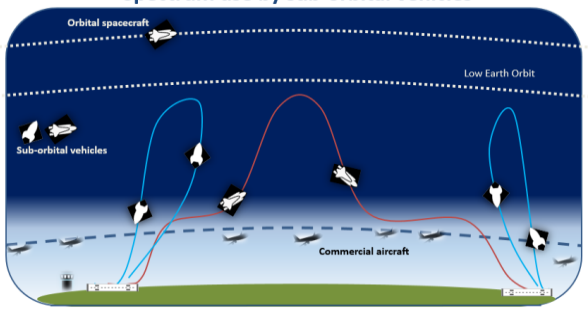
  - Frequency Spectrum Management Panel (FSMP) is discussing some modifications to the ICAO position to align with the progresses made by relevant ITU Working Parties, which will be finalized by Q1 2023.

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



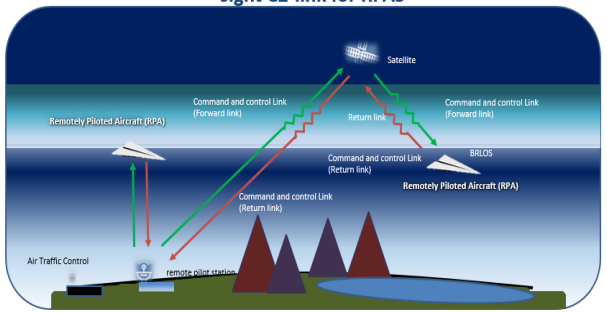

Original image from ICAO CP-DCIWG

**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**



# FREQUENCY SPECTRUM MANAGEMENT

- **Potential interference to Radio Altimeter and development of the 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 frequencies 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.

# FREQUENCY SPECTRUM MANAGEMENT

- **Potential interference to Radio Altimeter and development of the relevant SARPs**

  - 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 radio altimeters.

  - ICAO published a State Letter (Refer to SP 74/1-21/22 published in 25 March 2021)which encourage States and 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.

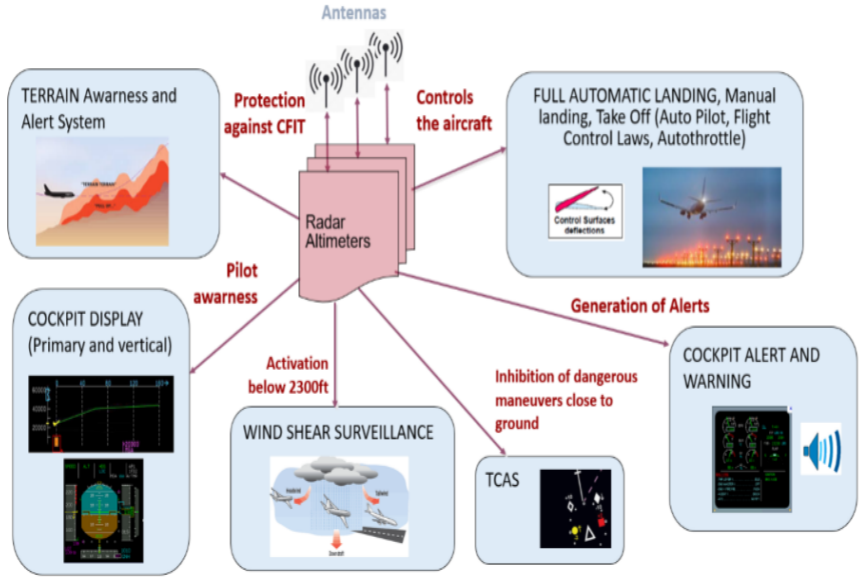
# FREQUENCY SPECTRUM MANAGEMENT

- **Potential interference to Radio Altimeter and development of the relevant SARPs**

  - FSMP continue its investigation and is striving efforts to provide States with more guidance on relevant mitigation technics as a temporary measure. Furthermore, FSMP has initiated the development of SARPs for new Radar Altimeter designs, which is one of key FSMP ongoing tasks. This require a close coordination with other Standard Making organizations.

Also, relevant WPs will be discussed under the agenda item 30 (Aviation Safety and Air Navigation Policy) at the 41st Assembly (27 Sep to 7 Oct 2022).

(Assembly 41st Session (icao.int)



# FREQUENCY SPECTRUM MANAGEMENT

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

  - Changes to the international radio frequency regulations agreed to at the 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.

# 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 WG/14 held in April 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. This PfA will be progressed to the Panel's approval in September 2022. WAIC SARPs will be a new chapter in Annex 10, Volume V dealing with the frequency band 4200-4400 MHz. That chapter would also then be appropriate for the radar altimeter SARPS when they are completed.

# 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

Work is being initiated to undertake this study. 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

# CURRENT STATUS OF INTEGRATED CNS AND SPECTRUM TASK FORCE (ICNSS) WORK

- A new task has been initiated in coordination with ANC, looking into the long-term evolution of CNS and spectrum matters, as per AN-Conf/13 Recommendation 2/2.1.
  - Initially this task is being progressed using a small informal taskforce, consisting of select industry representatives, CNS panel participants and Secretariat.

# CURRENT STATUS OF INTEGRATED CNS AND SPECTRUM TASK FORCE (ICNSS) WORK

• The ICNSS-TF is currently working on the development of **global concept for Integrated Communications, Navigation, Surveillance (CNS) and Spectrum** which would 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:

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

Also, relevant WPs (such as A41-WP/58 TE/5) will be discussed under the agenda item 31 (Aviation Safety and Air Navigation Standardization) at the 41st Assembly (27 Sep to 7 Oct 2022).

(Assembly 41st Session (icao.int)

# OTHER CNSS ACTIVITIES

Refinement of Frequency Finder (FF)

- In order to better support States and ICAO regional offices, ICAO has successfully further enhanced and implemented the following features to Frequency Finder tool:

  Plotting interference contours in the NAV module; and

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

  *Furthermore, there are several other enhancements 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)

- Several workshops were/will be conducted to assist States in use of FF

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

# ONLINE COURSE DEVELOPMENT RELATED TO **FREQUENCY MANAGEMENT FOR CIVIL AVIATION**


2022

**DEVELOPMENT OF A WEB-BASED TRAINING COURSE**

- Course 1 - Overview of Frequency Management (expected to be launched in 2022)
- Course 2 - Frequency Management Process
- Course 3 - Frequency Management Application

3 stand alone courses

- Unit 1- Overview of frequency spectrum used for aeronautical services
- Unit 2. Familiarization with the regulations relating to the Frequency spectrum used for aeronautical services
- Unit 3 Spectrum Management Process
- Unit 4 - -Frequency management process of aeronautical process
- Unit 5. Interference protection in relation to spectrum management
- Unit 6. Frequency management process for aeronautical radio communication systems
- Unit 7. Frequncy assignment planning criteria for aeronautical radio communication systems- Introduction of ICAO Frequency Finder tool

Course duration 12 hours

***Unit 1 is expected to be lunched soon (in September 2022)!***

**Coordination with Global Aviation Training Section**

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# Thank You

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