

ICAO

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IFATSEA
International Federation of Air Traffic Safety Electronics Associations

AIR NAVIGATION WORLD

COMMUNICATIONS, NAVIGATION, SURVEILLANCE, AND SPECTRUM

CNSS 2026

12 - 15 October | Kotor, Montenegro



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Session 19

How to design and implement new systems to meet future spectrum challenges



Mr. Christian Fleury



Mr. Christian Fleury is an Air Safety Electronic Systems Engineer (ENAC Class of 1991) working for the French Air Navigation Service Provider (DSNA).

He began his career in Northern France, focusing primarily on the management of ground-based radio navigation aids, before gaining experience across a wide range of areas within the vast airspace of French Polynesia.

He is now based in Toulouse, where he has served as the Spectrum Manager for over ten years.

He has the privilege of representing France on the ICAO Frequency Spectrum Management Panel (FSMP) since its establishment in 2015, and since 2023 he has been honoured to serve as vice-chair.

Session 19

How to design and implement new systems to meet future spectrum challenges

- New challenges: The arrival of new players and digital technologies, as well as the acceleration of innovation, have rendered traditional approaches to CNS development obsolete.
- A new approach is required: aviation must design more agile, integrated and adaptive systems, incorporating spectrum management from the outset to ensure security, interoperability and resilience.
- Objective of the conferences (flash talks): They will present innovative, modernisation and intersectoral coordination solutions to optimise the use of the spectrum in a rapidly changing environment.

Session Aims: Flash talk

- These flash talks will explore designing and integrating future CNS systems to handle increasing spectrum demands through innovation, modernization, and cross-sector coordination, ensuring resilient and efficient spectrum use in modern aviation.

Mr. Andrew Roy



Mr. Andrew Roy is the Director of Engineering Services at Aviation Spectrum Resources, Inc. (ASRI), acting as a focal point for US airlines and other commercial aviation operators on spectrum engineering and regulatory considerations.

He is Chair of the ICAO Frequency Spectrum Management Panel and is a member of the RTCA Program Management Committee.

Roy is a veteran of the UK Royal Air Force with a background in RF battlespace management.

He earned his master's degree in systems engineering from Loughborough University and is a Chartered Engineer at the UK Institute of Engineering and Technology.

Mr. Katsuyuki Arakawa



Mr. Katsuyuki Arakawa is an engineer at the Japan Civil Aviation Bureau (JCAB), where he leads the planning and implementation of Communication, Navigation, and Surveillance (CNS) systems.

With over 20 years of experience spanning the deployment and operation of CNS infrastructure, he brings a deep, practical understanding of how these systems function in real-world aviation environments.

He has actively participated in ICAO panel meetings, contributing to international discussions on air navigation systems and spectrum policy. He currently serves as Chair of the ICNSS-TF, where he works with members across industries and civil aviation authorities to advance the standardization framework.

Audience Interaction and Discussion

Poll Questions for Session 19

Approximately how many pages does ICAO Annex 10 contain in total (including green pages)?

- ☐ 500
- ☐ 700
- ☐ 1000
- ☐ 1200
- ☑ 1500

Please add discussion questions to Slido

Spectrum Considerations for Designing Aviation CNS Systems

Andrew Roy - Frequency Spectrum Management Panel (FSMP) Chair

Scope

01 Spectrum Environment Considerations

02 The Role of Standards in Design

03 Design Recommendations

04 Balancing Integrated Functions

05 Planning for a Spectrum Lifecycle

06 Closing Thoughts

What are the considerations when building a system in a modern spectrum environment?

- Spectrum is a constantly evolving environment
  - Driven by competition and revenue
- Change can be dynamic and unexpected
  - Progress is slow but decision can be made overnight
- Political process
  - Based on a technical foundation (…ideally!)



How do Aviation Standards Support Global Spectrum Management?

Provides the foundation for sound spectrum policy structures

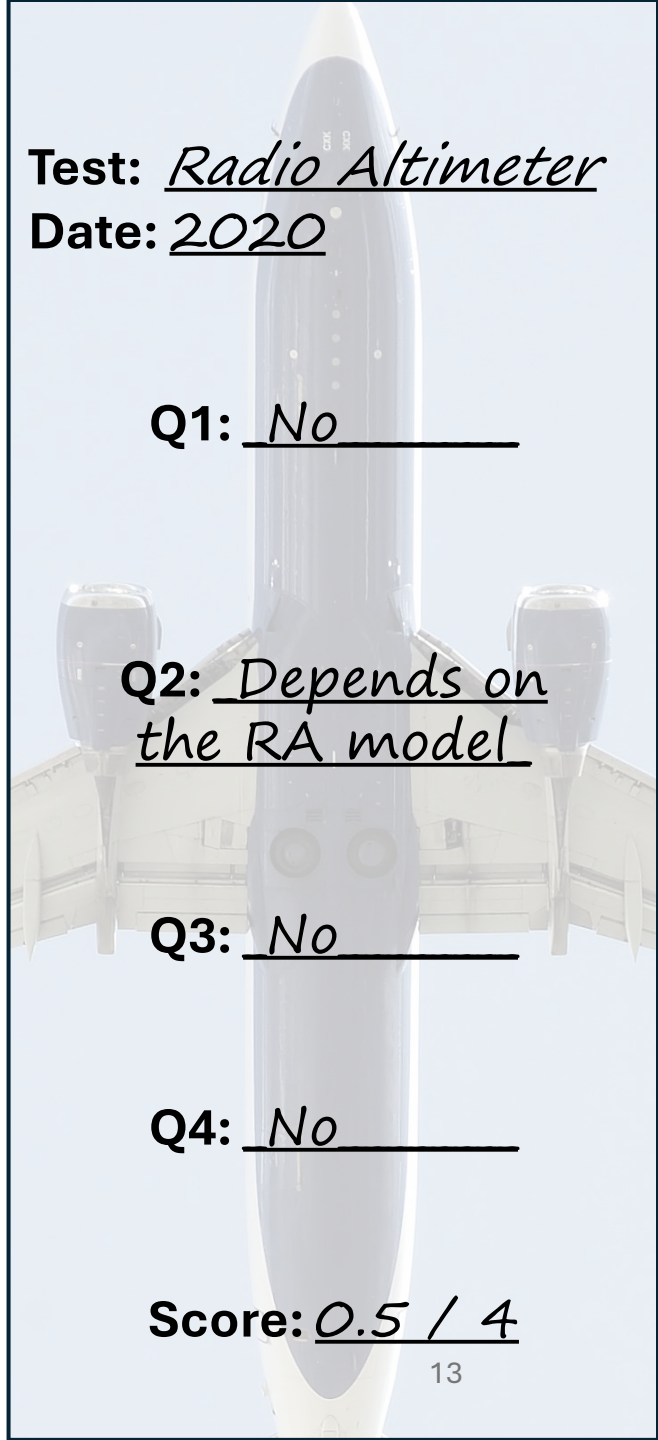


….but significant issues without!



Design Recommendations

- Define spectrum performance
  - Does the documentation create a complete spectrum performance profile?
- Optimize the design
  - Does the design build beyond the minimum for when things will change?
- Design decisions are justified
  - Are the key design decisions/tradeoffs explained?
- Accessible material
  - Can non-aviation organizations understand what has been done?



Test: Radio Altimeter
Date: 2020

Q1: No

Q2: Depends on the RA model

Q3: No

Q4: No

Score: 0.5 / 4

Balancing Integration of Functions



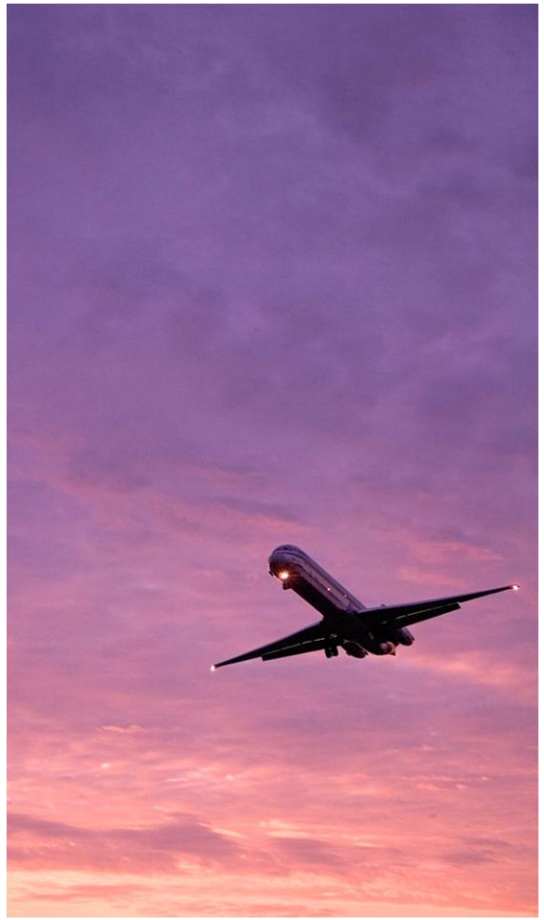
- Integration of CNS functions has benefits
  - Efficient use of spectrum
  - Coordination between aviation systems is easier than non-aviation
  - Reduce airframe system complexity
- But is also has tradeoffs….
  - Spectrum issues are lower risk, but higher impact
  - Aviation compatibility still an overhead with growing complexity
  - An improved design may be limited by other functions

Planning for a Spectrum Lifecycle

- Aviation suffers from 2 major disadvantages
  - Long product lifecycles
  - Difficult to change in-service systems
- Results in small design changes having an oversize impact on operational life
  - Choices on power, filtering, etc.
- Designs should account for the total life cycle cost of spectrum
  - What can be included now for additional flexibility or robustness to environmental changes?
  - How to balance different interests?



Closing Thoughts



- Aviation should focus on optimized spectrum designs
  - Future of spectrum is unknown other than change
- Integrating CNS functions has multiple benefits
  - However…. it does change the spectrum risk profile
- Total spectrum lifecycle should be considered
  - Building beyond the minimum can reduce risk and costs over the equipment lifecycle

ICNSS Global Concept

Katsuyuki Arakawa,

Air Traffic Safety Electronics Personnel,

Japan Civil Aviation Bureau

Contents

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02 Overview

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04 Brief History of CNS Standards

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01

Background

ICNSS-TF establishment

In accordance with AN-Conf/13 Recommendation 2.2/1 c) as further supported by the 40th Assembly

to:

Draft an initial roadmap of CNS and Spectrum (CNSS) evolution in the medium and longer term.

Define a new/streamlined SARPS and Standards Framework, leveraging a more performance-based approach for Annex 10.

*Also, note **AN-Conf/13 Recommendation 5.5/3**:*

- *calls upon ICAO to review and enhance its Standards-making processes to meet the requirements of the rapid pace of technological development.*

Establishment of the Integrated CNS and Spectrum Task Force (ICNSS-TF)

Meetings

Conducted regular and frequent meetings.

As of October **2026**,

44 virtual meetings and **9 face-to-face meetings** in total

ICNSS – TF former Chair



Chaired by **Mr. Claude Pichavant** (Airbus)

Members

Approx **20** technical specialists (incl.15 members) nominated by States, Standard making organizations, international organizations and industry

Start up

The ICNSS-TF started its activities on

28 May 2020

Challenges

- Key Challenges Acknowledged by the ICNSS-TF



- **Accommodating New Entrants and Managing Airspace Complexity**



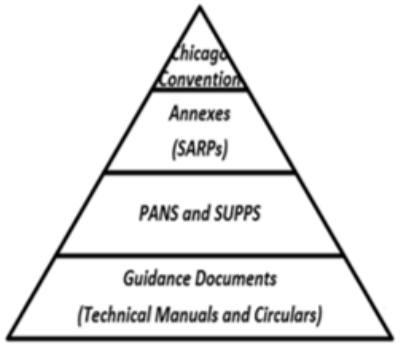
- **Increasing Pressure on Aeronautical Spectrum**



- **Institutional Challenges**

1. **Slow Global Adoption of New Technologies**
2. **Regulatory Framework Not Keeping Pace with Innovation**

ICAO document framework



ICAO technical publications	Adoption/ Approval	ANC review	States' consultation	Legal obligations
International Standards and Recommended Practices (**SARPs**)	Council in accordance with Articles 54,37 and 90 of Convention	Yes	Yes	Standards in SARPs convey legal obligations. "Shall" is used in SARPs.
Procedures for Air Navigation Services (**PANS**)	Council	Yes	Yes	PANS do not have the same status as SARPs. PANS are recommended to Contracting States.
Regional Supplementary Procedures (**SUPPS**)	Council	Circulated to ANC members for their comments	through Regional Offices	SUPPS do not have the same status as SARPs.
Guidance documents (Technical Manuals and Circulars)	Published under Secretary General	No	No	This does not convey legal obligations. (The current practice of referring to guidance documents by way of a Note only provides guidance)

02

Overview

Relationship between the Draft Global ICNSS TF Document & GATMOC



Overview of the ICNSS Task Force

INTEGRATED CNS and Spectrum Task Force

ICNSS roadmap Task
Develop CNSS roadmap on flexible and continuing technical evolution

CNSS Standards Task
Define Performance Standards vs Technical Specifications

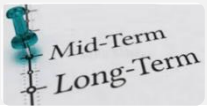
End goal

ICNSS roadmap

(Minimal Essential) SARPs framework

Global Technical Specification framework











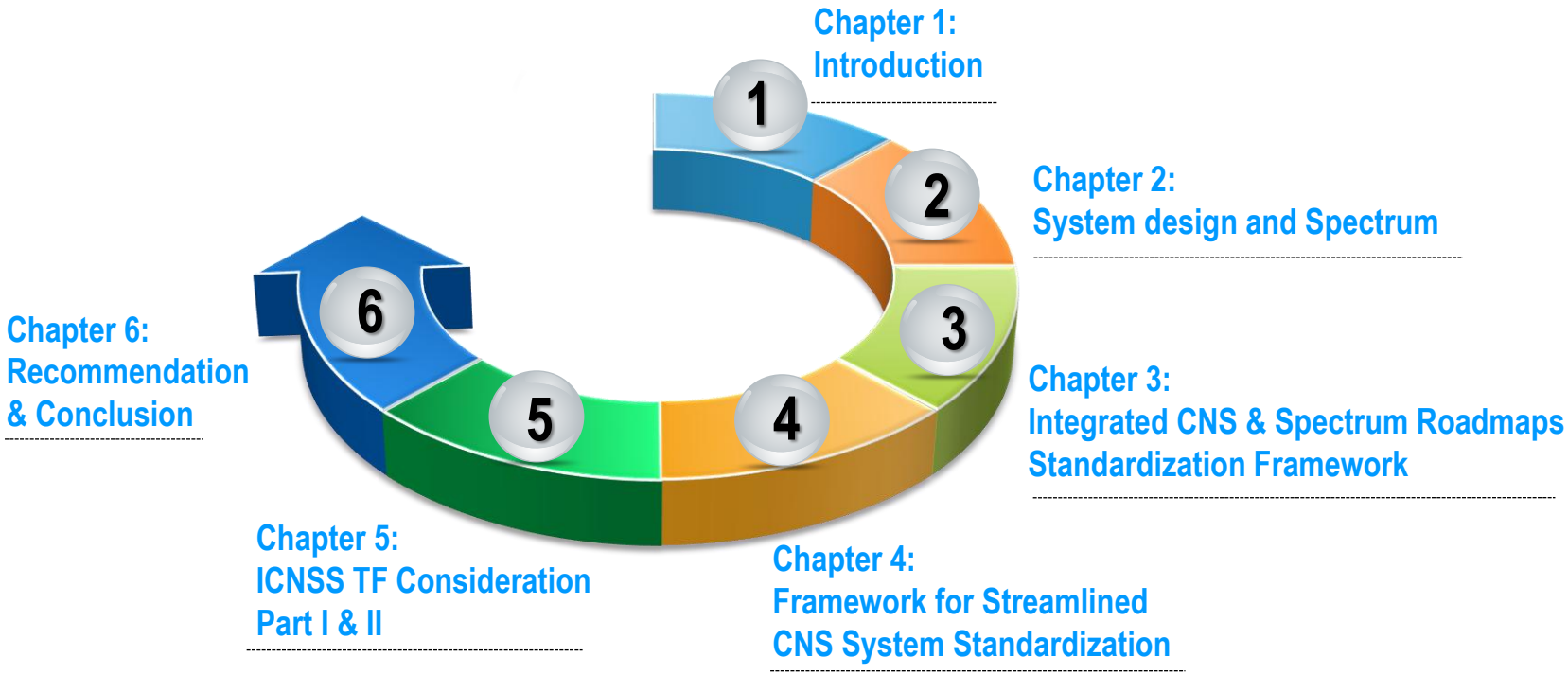


03

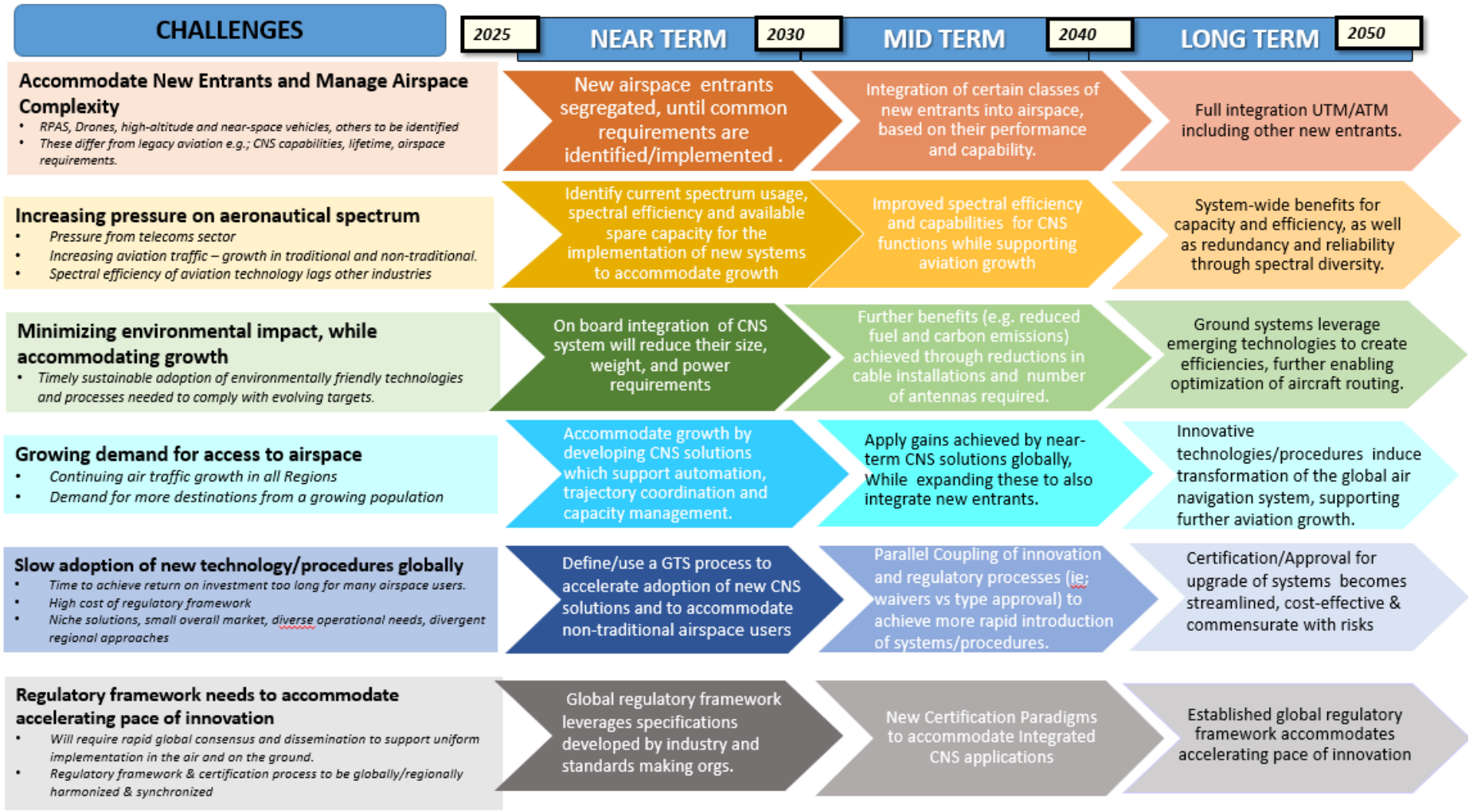
Chapter description

The Status Today

1. **The Integrated CNS and Spectrum Roadmap task and the CNS Standards task will be rolled up into one main deliverable: *Integrated CNS & Spectrum Global Concept***
2. **Composed of six chapters:**



Strategic roadmap (High Level Roadmap)



Chapter 3 Part II : Streamlined SARPs for CNS Standardization

1. Current Standardization Framework

- **ICAO's Role**: Standardizes CNS systems affecting safety/regularity for:
  - International interoperability/coexistence with the same/other aeronautical systems (air/ground, air/air, ground/ground, space-based).
  - Spectrum compatibility across systems/services sharing a frequency band or operating in adjacent band.
- **SMO Contributions (RTCA, EUROCAE, SAE):** Develop MASPS/MOPS providing further detail or address aeronautical systems.
- **Assembly Resolution A39-22 Directives:**
  - SARPs must be clear, simple, concise, mature, and stable.
  - Ensure safety, efficiency, interoperability.
  - Utilize SMO work with adequate verification/validation.
- **Past Efforts**: Significant efforts were made to reduce the page count of Annex 10. However, the lack of a well-established process has hampered its further rationalization.

Chapter 3 Part II : Streamlined SARPs for CNS Standardization

6. Achieving a Balanced Performance-based CNS Framework

- Structured & Harmonized Approach is Essential.

- **Foundational Steps**:
  - Clarify distinctions between performance-based standards, technology, and CNS service delivery models.
  - Identify differences and alignments across CNS domains.
  - Propose recommendations for a future unified concept.

- **Outcome:** Balancing performance-based flexibility with essential signal in space parameters drives global implementation, fosters innovation, and enhances CNS evolution, ensuring operational efficiency, technological adaptability, and global interoperability.

Chapter 6.1: Recommendation for ICAO and Industry Stakeholders Cont.…

Recommendation 2: **Streamline the ICAO CNSS Standardisation Framework**

a. **Implement minimal essential SARPs.**
b. **Introduce Global Technical Specifications (GTS):**
   - Adress detailed requirements with ‘shall’ statements.
   - Reference validated industry standards from SMOs.
c. **Amend ANC’s Guide to Drafting SARPs & PANS (2015).**
d. **Trial new approach with a selected system.**
e. **Revise relevant parts of Assembly Resolution A39-22.**

04

Brief History of CNS Standards

History of Convention on International Civil Aviation

The **Convention (Chicago Convention)** was **adopted (signed)** on **7 December 1944**, **Entered into force: 4 April 1947**

Period	Key Events
1944–1947	Chicago Convention signed; ICAO established
1947–1950	First Annexes published (1–10)
1960s	Annex 10 restructuring; Doc 8400 created
1970s–1990s	Expansion to 18 Annexes; security Annex added
1995	Annex 10 becomes 5 volumes
2013	Annex 19 (Safety Management) added
2021–2023	RPAS and DFMC GNSS standards adopted

The VOR SARPs

The **VOR (VHF Omnidirectional Radio Range) standards** in ICAO Annex 10 were first published when Annex 10 itself was originally adopted and became effective.

Key publication dates

- **30 May 1949** — ICAO Council **adopted** the Standards and Recommended Practices (SARPs) for Aeronautical Telecommunications, designated as **Annex 10**.
- **1 March 1950** — Annex 10 **became effective**, including the early VOR specifications.

Context

- Annex 10 originally contained **Part I – Equipment and Systems**, which **included radio navigation aids** such as **VOR**.
- Over time, Annex 10 was restructured (1965, 1995---and later), but **VOR standards have remained part of Volume I** (Radio Navigation Aids), and **VOR continues to operate as an active system** in the current operational environment.

The long lifecycle of CNS Systems



STEP 01

Planning and Requirement Gathering

- Operational Need analysis
- Stakeholder consultation
- Transition Planning

STEP 02

Technology Selection and Safety Assessment

- System Architecture
- Technology Selection
- Safety Assessment

STEP 03

Development

- Hardware and Software Development
- Integration and Testing

STEP 04

Implementation

- Deployment
- Training
- Documentation

STEP 05

Maintenance & Evaluation

- Preventive Maintenance
- Corrective Maintenance
- Data Analysis & Monitoring

STEP 06

Decommissioning

- System replacement
- Data archiving
- Decommissioning process

05

Conclusion

Conclusion



Aviation should modernize its CNS systems and standardization processes to keep pace with technological change, address increasing spectrum pressures, and safely integrate new airspace users.

The ICNSS Task Force offers a globally harmonized way forward through a strategic roadmap and a streamlined CNS standardization framework and invites stakeholders to further develop the ICNSS technology roadmap and to explore the proposed new standardization approach.

QUESTIONS?

Scan the QR code to join Slido ask questions, and participate in interactive activities

Closing Thoughts

1. What is “Minimal Essential” ?

What level of technical detail is required in CNS specifications for to support certification, installation, operation, and maintenance activities performed by ATSEP?

2. What Is Your Vision of Integrated CNS?

After hearing this presentation, how do you envision an integrated CNS, and what do you see as the key challenges and enablers for transitioning from conventional CNS systems?

3. How Should We Balance Integration and Bottlenecks?

While integration can improve efficiency, it may also create single points of failure. How should we balance the benefits of integration against potential bottlenecks and resilience concerns?

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