AVIATION FREQUENCY SPECTRUM AND THE ITU
WORLD RADIOCOMMUNICATION CONFERENCES (WRC)

ITU WRC
DUBAI 2023

ITU WRC
SHARM EL-SHEIKH 2019
28 October - 22 November
Sharm El-Sheikh, Egypt
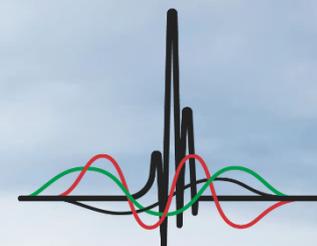
Preparatory Workshop for World Radiocommunication Conference for 2023 (WRC-23)
Cairo, Egypt, 28-29 August 2023

Mie Utsunomiya
CNS Technical officer
CNS and Spectrum Section(CNSS)
International Civil Aviation
Organization (ICAO)

Aeronautical Frequency Spectrum Management

Annual growth in global air traffic passenger demand from 2006 to 2020

Source
IATA
© Statista 2019

Additional Information:
Worldwide; IATA; 2006 to 2019

Note: world total scheduled services
Source: ICAO
*preliminary figures
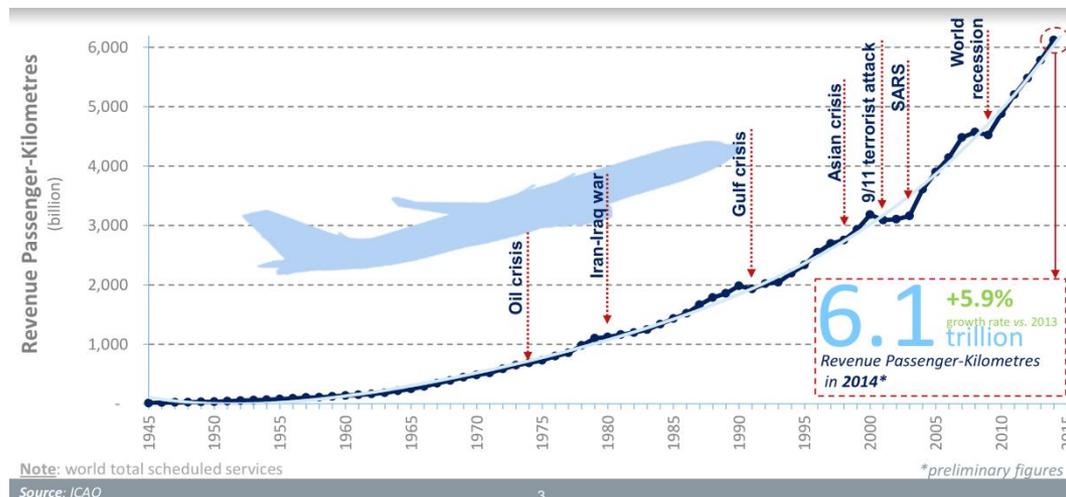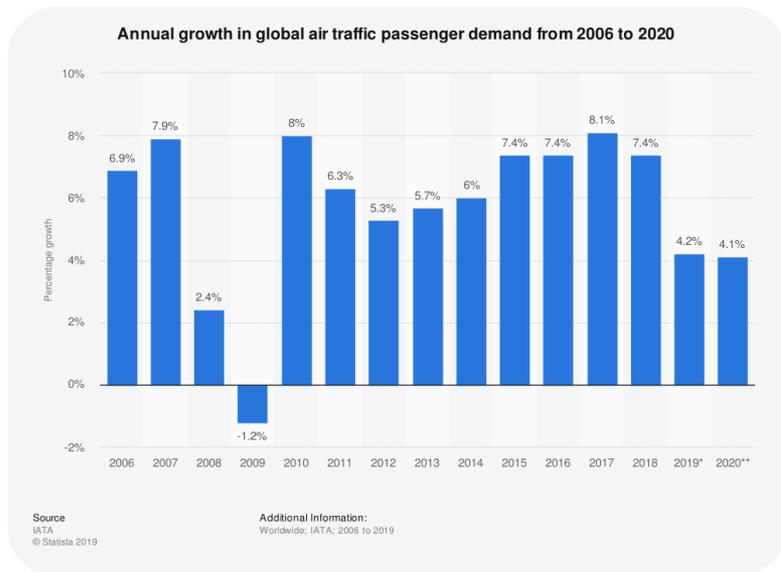
World wide consistent growth of air traffic
Doubles every 15 years

→ In **2019** over **4.5 billion scheduled passengers**

→ **Air transport** now **carries 35% of world trade**, by value

→ **Between 2019 and 2038,** 4.6 % expected growth of no. of airline passengers (pre-Covid-19 numbers)

2

ICAO

Aeronautical Frequency Spectrum Management

Accurate navigation, landing guidance, situational awareness (airborne collision avoidance system, radar, radio altimeters) weather radar and reliable communications with air traffic control are prerequisites for a safe flight

Communications with Air Traffic Control

Situational awareness

airborne collision Avoidance system

Accurate navigation

Radar

Radio altimeters

Landing guidance

Critical functions

Weather Radar

GPS Antennas

Low Gain Satellite Antenna

High Gain Satellite Antenna

Displays — TCAS II — Mode S

Amplifier

Flt Deck Displays/ Alerting

Satellite Data Unit

MMR ILS GPS

Flight Management System

Monitoring Alerting System

Flight Management System

ACARS Management Unit

HFTransceiver

Audio Control Panel

Radio Tuning Panel

Autopilot/ Flight Director Systems

VOR

DME

IRS

VOR

DME

VHF Transceiver

TCAS II   Mode S

ILS Antennas

TCAS II Antenna

Mode S Antenna

DME Antennas

VOR Antennas

VHF Antenna

3

Aeronautical Frequency Spectrum Management

**Over 1 GHz of frequency spectrum
in global allocations to aeronautical safety services**
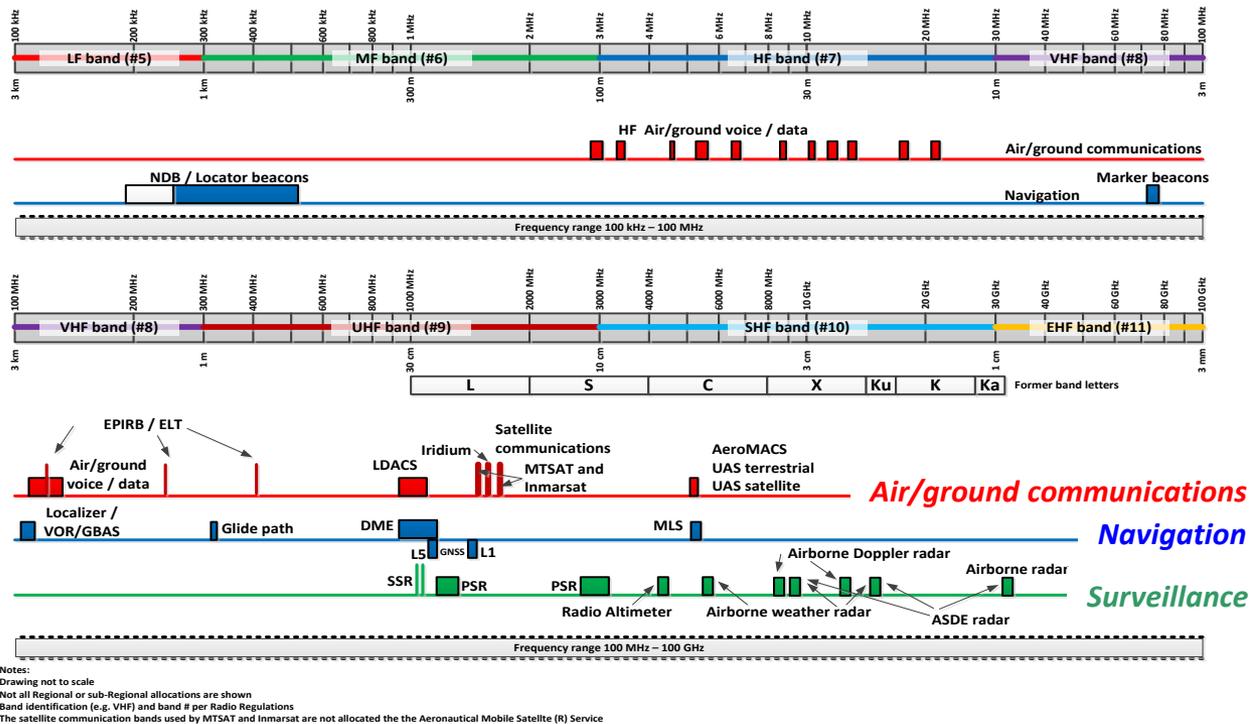
All those allocations are adjacent to other services:

• **Radio and television broadcast, satellite, cell phone, WiFi ...**

4

Performance of Air Traffic Management

Availability and **access** to **frequency spectrum** is completely dependent on an outside program:

The **ITU World Radiocommunication Conferences**; and the WRC preparatory process in the ITU and the Regional Telecommunication Organizations

5
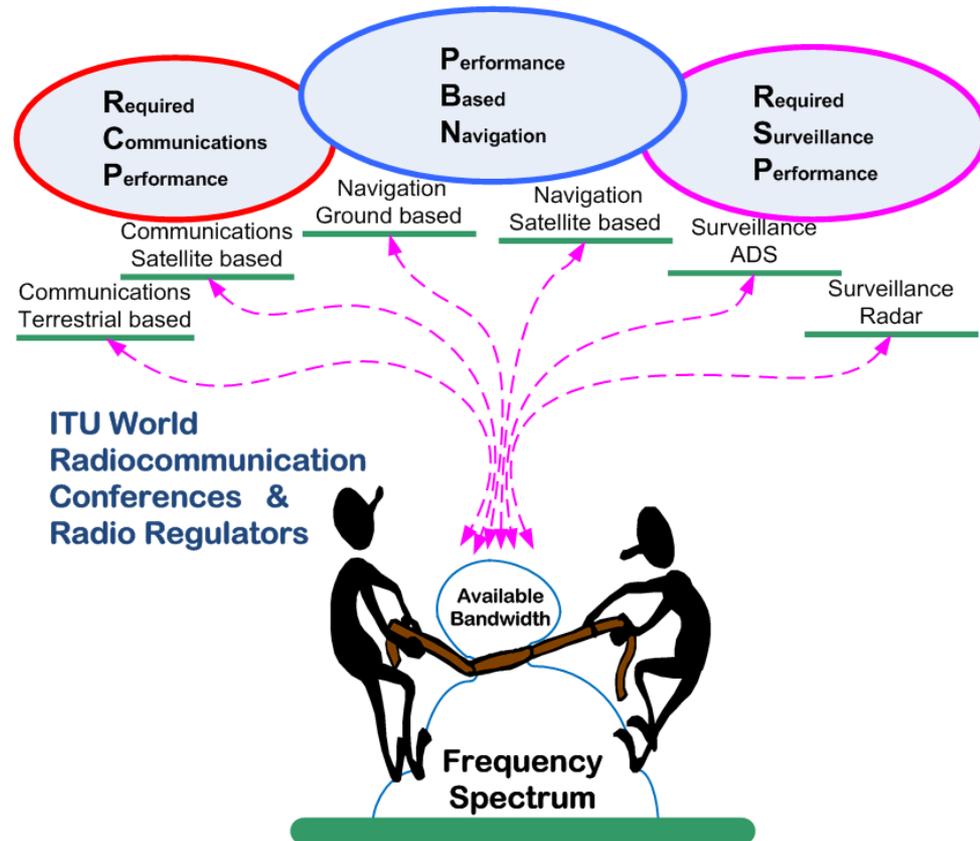
Aeronautical Frequency Spectrum Management

Scarce natural resource with finite capacity limits and constantly increasing demands

Congestion imposes the need for efficient frequency spectrum management

SPECTRUM MANAGEMENT

Combination of administrative and technical procedures

SPECTRUM MANAGEMENT

necessary to ensure interference free and efficient operation of radio services (e.g. Air/Ground Communications and Radionavigation)

Aeronautical Frequency Spectrum Management

The highest level of Spectrum Management takes place at the ITU World Radiocommunication Conferences (WRC), held every four years

Maintenance of the **International provisions for Spectrum Management**, contained in the ITU Radio Regulations (RR)

This includes maintenance of the **Table of Frequency Allocations**

A consequence of this process is that **aeronautical frequency managers** need **to develop, and lobby** for an **aviation position** on frequency spectrum use

Radio Regulations

Edition of 2016

Aeronautical Frequency Spectrum Management

National level	**Regional Level**	**International level**

National level
- National position is developed and coordinated by the National Frequency Spectrum authority
- Aviation is but one of many users that lobby for attention

Regional Level

- National telecommunications authorities co-ordinate their position through regional organizations
- Aviation representatives may not be allowed to speak up as the National Frequency Spectrum Authority has only "one official position"
- ICAO is allowed to participate

International level
- National telecommunications authorities co-ordinate their position through the ITU-R Study Groups
- National delegation has only "one official position"
- States look to ICAO for guidance on aviation matters

ITU in brief

UN Specialized agency established to standardize and regulate international radio and telecommunications

Radio Regulations

International treaty

➢ Facilitate <u>equitable access</u> to and <u>rational use</u> of the radio frequency spectrum and the geostationary orbit

➢ Ensure <u>availability</u> and <u>protection from harmful interference</u> of frequencies for <u>distress and safety</u> purposes

➢ Assist in prevention and resolution of cases of harmful interference

➢ Facilitate efficient and effective operation of radiocommunications services

➢ Provide for, and regulate new applications of telecommunications technology

9

ITU WRC - General overview

1 **WRCs update the International Radio Regulations**

2 **Held every 4 years**
- Last was 28 Oct - 22 Nov 2019
- Next in Q4 2023

3 **Main purposes**
- To revise the Radio Regulations (RR);
- To address Radiocommunication issues of a worldwide character.

4 **Why participate at World Radiocommunication Conferences**
- To protect existing services
- To obtain access to spectrum for new services
- To enhance spectrum access for existing services
- To facilitate market access for radio equipment manufacturers; and
- To provide regulatory certainty to operators

ICAO

ITU WRC
WRC-19 by numbers

~3500 delegates

- Over 50 meetings/day, including weekends
- After 4AM – latest finish to a meeting
- 9AM - ...start time the next (same) morning

4 Weeks
(5 ½ weeks, when counting RA-19 and CPM19-1)

ITUWRC
SHARM EL-SHEIKH 2019
28 October - 29 November 2019
Sharm El-Sheikh, Egypt

- 165 Administrations
- Several UN specialized agencies and offices, including ICAO, IMO, WMO, UNOOSA...
- 260 other international / regional, scientific and industrial agencies or organizations.

ITU WRC-19
Main Outcomes

- **Aeronautical communications**

  Agenda Item 1.10: Spectrum needs and regulatory provisions for the introduction and use of the global aeronautical distress and safety system (GADSS)

- A proposal was supported by many administrations, requiring that details on the technical characteristics for radiocommunication systems used for GADSS should be reflected in the ITU Regulatory framework.

- This proposal, if enacted, could potentially delay implementation of the GADSS

- Proposal was averted, thus **ensuring that GADSS provisions can continue to stay performance based**

ITU WRC-19
Main Outcomes

- **Maritime communications**

  Agenda Item 1.8: Possible regulatory actions to support the modernization of global maritime distress and safety systems (GMDSS)

- Measures were adopted to modernise the GMDSS and to include a new satellite system provider

- The proposals for the conference, if enacted, **would have lost the priority and protection access by aviation** to the system operated by the same satellite provider

- Through ICAO efforts, **this was averted** and in fact the aeronautical priority access was strengthened by removing existing inconsistencies

13

RECONNECTING**THE**WORLD

ITU WRC-19
Main Outcomes

- **Scientific use of spectrum**

  Agenda Item 1.7: Spectrum needs for telemetry, tracking and command in the space operation service (SOS) for non-GSO satellites with short duration missions (non-GSO SD)

- A large number of non-GSO SD satellites are envisaged, causing considerable loading on frequency band(s) selected

- The aeronautical VHF Data Link Mode 2 (VDLM2) system, operating at the top of the aeronautical VHF band (136.975 MHz) at high risk of interference

- Very difficult discussion resulted in a compromise:

  - a 25 kHz guard band; and

  - an ITU Resolution which requires as a minimum, the whole of the occupied bandwidth of the emissions by the non-GSO SD SOS stations is maintained completely above 137 MHz

- Efforts need to be undertaken by aviation stakeholders to ensure the continued safe operation of VDLM2

ITU WRC-19
Main Outcomes

- **Other relevant items**

  Agenda Item 9.1.4: Stations on-board sub-orbital vehicles

- A new WRC-23 item decided, to consider regulatory provisions to facilitate the introduction of sub-orbital vehicles, in particular any potential new/modified definitions in the RR to accommodate such operations

- ICAO to participate in the studies and provide ITU with the relevant technical characteristics required for the studies

- Appropriate solution by WRC-23 could for instance facilitate tracking of space launch vehicles by ADS-B, thus reducing any impact caused by space launches and by reducing the size of the restricted area of affected airspaces

Aeronautical Frequency Spectrum Management
ITU Radio Regulations update cycle

➢A very competitive environment

➢ Aviation or any other sector cannot expect preferential treatment

➢ Those that do their homework and participate succeed, others lose

Definition of Radio Frequency Management:

"Radio frequency management is done by experts who meld years of experience with a curious blend of regulation, electronics, politics and not a little bit of larceny. They justify requirements, horsetrade, coerce, bluff and gamble with an intuition that cannot be taught other than by long experience."

Vice Admiral Jon L. Boyes U.S. Navy

# The ITU WRC-23 agenda

will be very busy
for aviation

1 Spectrum use by sub-orbital vehicles

2 potential facilitation of aeronautical VHF over satellite

3 Finalization of a satellite allocation enabling beyond-line-of-sight C2-link for RPAS

4 Modifications to aeronautical HF, potentially enabling crystal clear and reliable HF voice as well as HF data

5 Potential new non-safety aeronautical mobile service allocations

6 Difficulties or inconsistencies encountered in the application of the Radio Regulations

ICAO
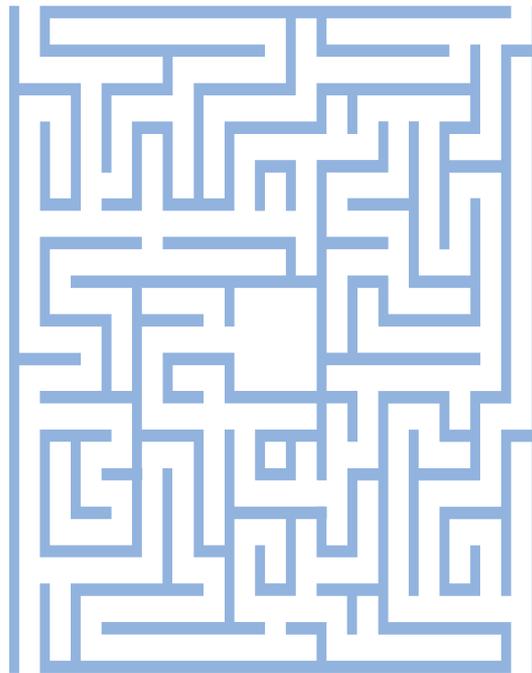
WRC-23

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

Orbital spacecraft

Low Earth Orbit

Sub-orbital vehicles

Commercial aircraft

18

Free images of spacecraft from Pixabay
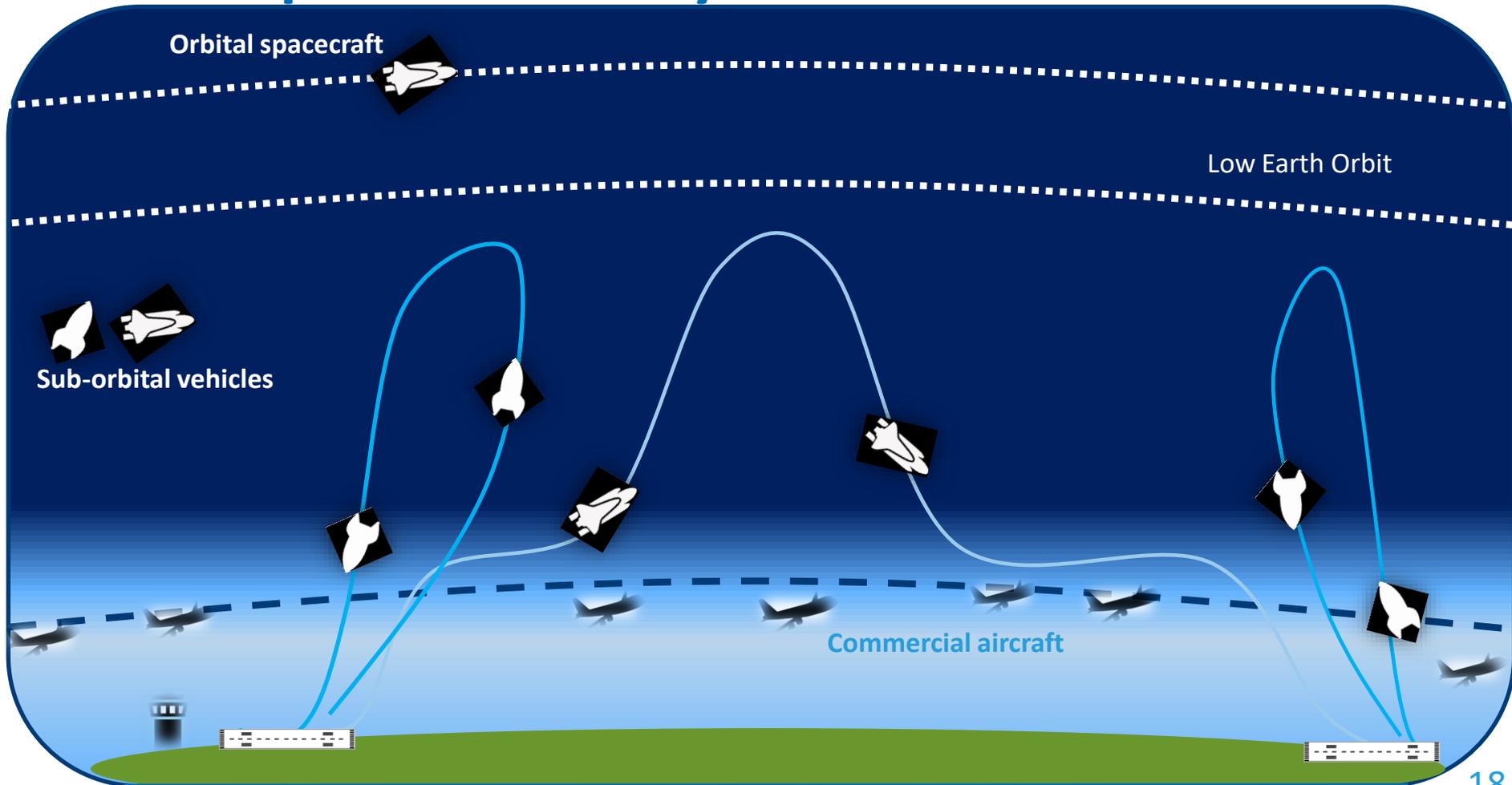
WRC-23

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

Satellite

Digital Feeder Link

Analog VHF Link

Ionosphere

Control Center

Original image from ICAO CP-DCIWG

RECONNECTINGTHEWORLD
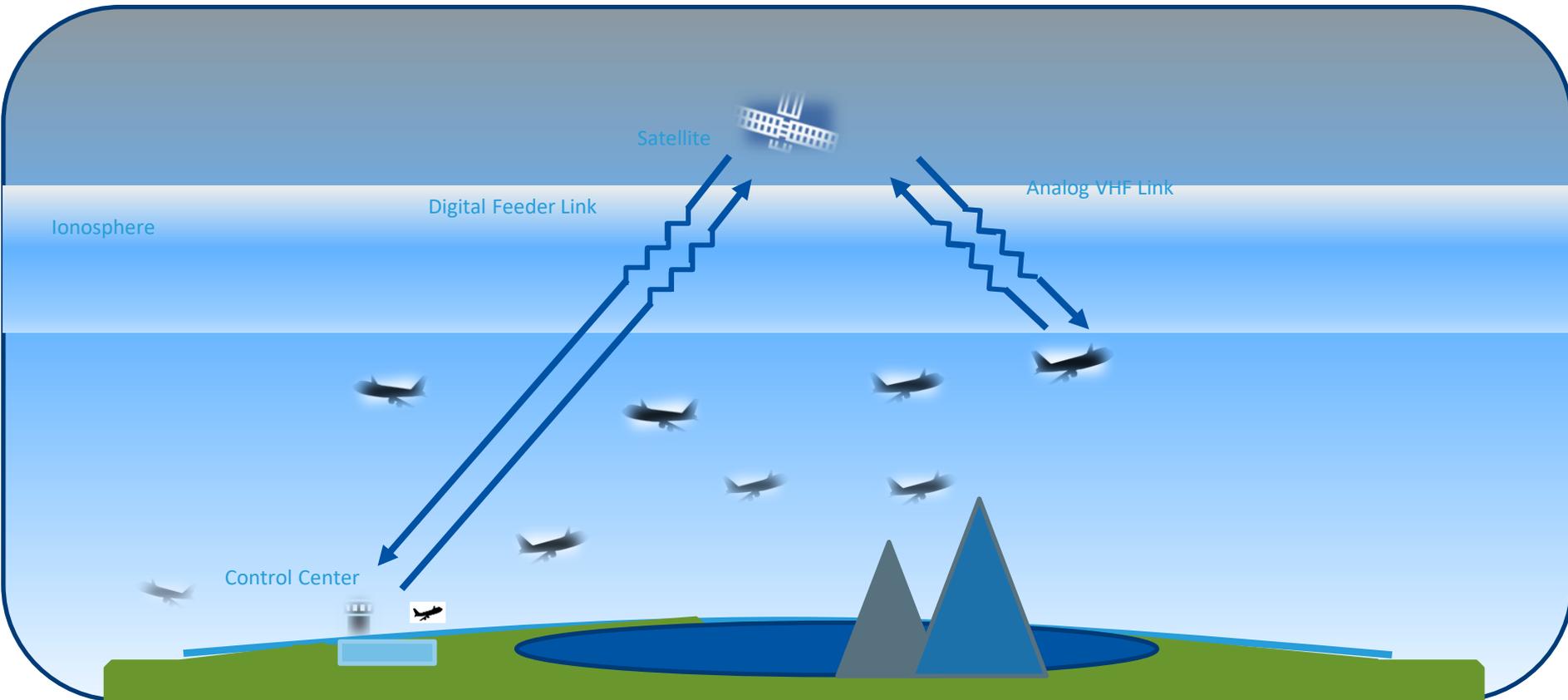
WRC-23 Agenda Item 1.8:
Finalization of a satellite allocation enabling beyond-line-of-sight C2-link for RPAS
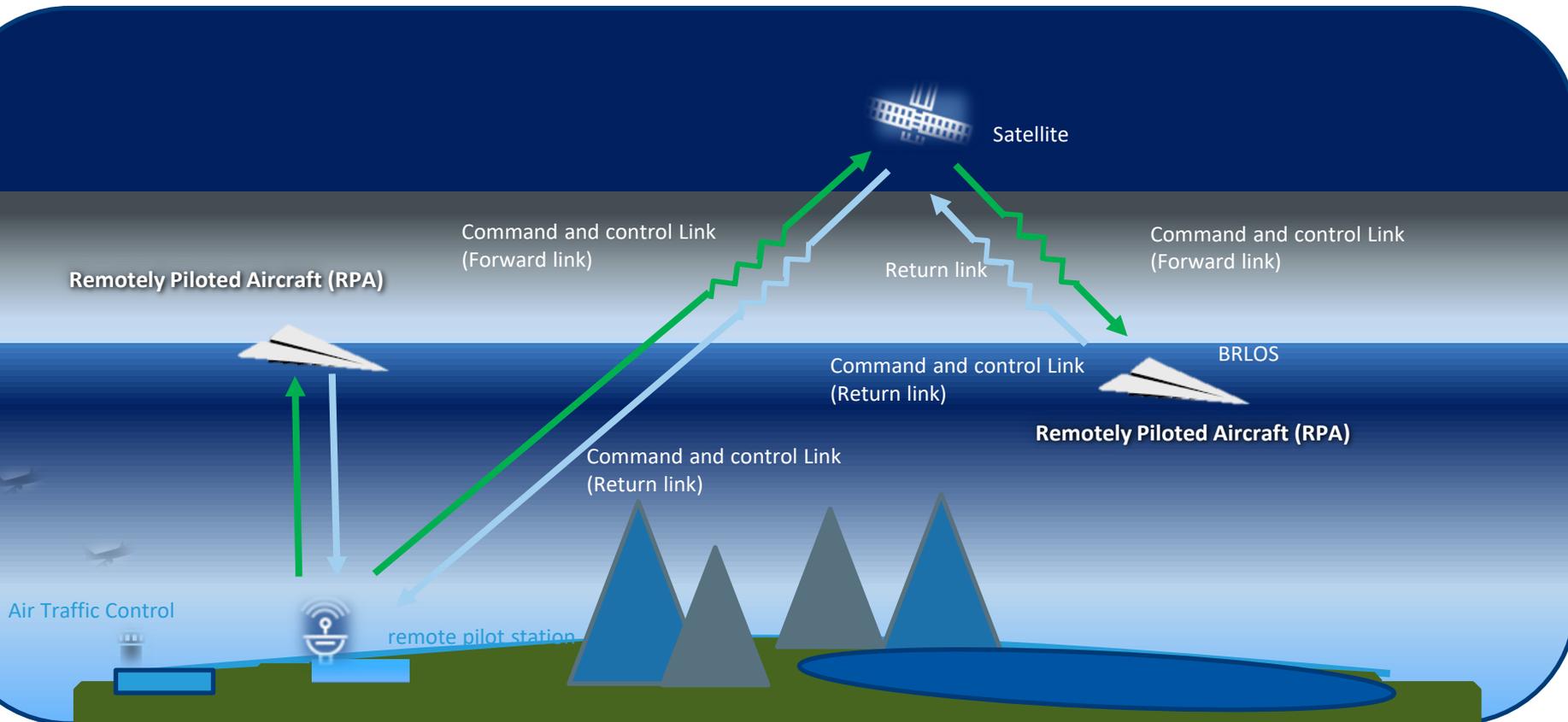
WRC-23 Agenda Item 1.9:

Modifications to aeronautical HF, potentially enabling crystal clear and reliable HF voice as well as high speed HF data

Ionosphere
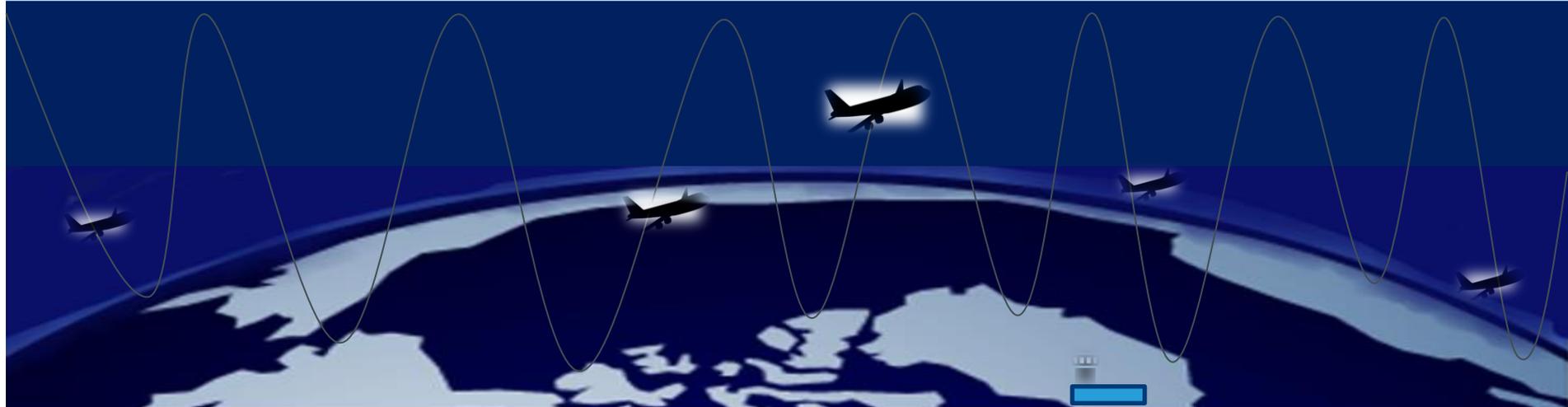
Management and Defence
of Aviation Frequency Spectrum

ICAO Frequency Spectrum Strategy

High level vision on existing and future spectrum requirements in support of the evolving CNS systems and infrastructure requirements

ICAO Frequency Policy Statements

Statements of official policy on each and every frequency band used by aeronautical systems for the provision of CNS
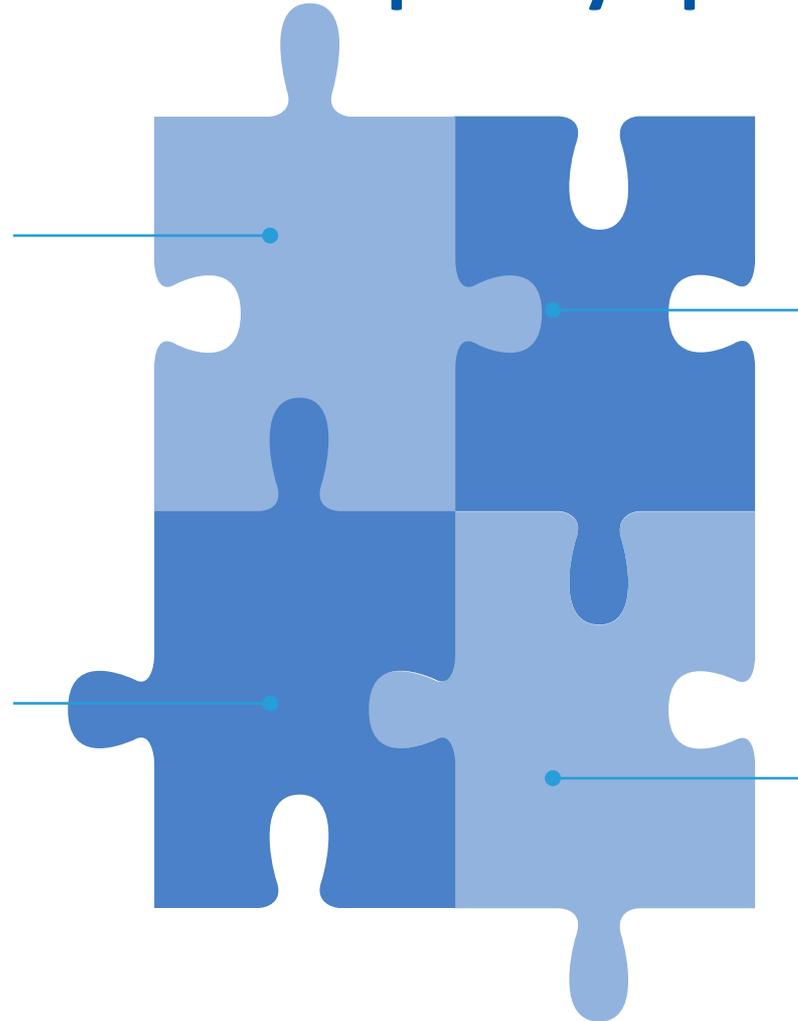
ICAO Position for WRC

ICAO Position on the specific agenda items of the upcoming ITU WRC to ensure that aeronautical requirements and safety concerns are met

Strategy for establishing and promoting the ICAO WRC Position

➢ including Assembly Resolution A41-7

22

ICAO Spectrum Strategy
AN-Conf/12 Recommendation 1/12

› timely availability and appropriate protection of adequate spectrum

› create a sustainable environment for growth and technology development to support safety and operational effectiveness for current and future operational systems

› allow for the transition between present and next generation technologies

› demonstrate efficient use of the spectrum allocated through efficient frequency management and use of best practice.
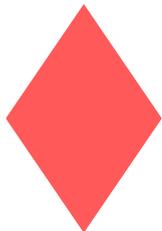
› clearly state in the strategy the need for aeronautical systems to operate in spectrum allocated to an appropriate aeronautical safety service
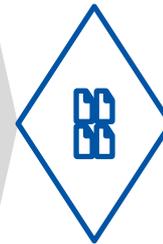
Develop and implement a comprehensive aviation frequency spectrum strategy to be referenced in the GANP

STRATEGIC
GLOBAL TECHNICAL
REGIONAL
NATIONAL

23

ICAO Spectrum Policy Statements

- WRC is limited to certain issues and certain frequency bands
- ICAO position only addresses spectrum usage in context with issues identified in the pre-set WRC agenda

The Policy Statements are "Official ICAO Policy" approved by Council

ICAO Policy Statements indicate overall ICAO policy for every frequency band used by aviation safety

The ICAO Policy Statements are contained in Chapter 7 of the Radio Frequency Handbook

Assembly Resolution A41-7

Urges Member States, international organizations and other civil aviation stakeholders to support firmly the ICAO frequency spectrum strategy and the ICAO position at WRCs and in regional and other international activities conducted in preparation for WRCs, including by the following means:

EFFECTIVE RESOURCE MANAGEMENT	Working to deliver efficient aeronautical frequency management and "best practices" to demonstrate the effectiveness and relevance of the aviation industry
SUPPORT AVIATION SPECTRUM STRATEGY	Supporting ICAO activities relating to the aviation frequency spectrum strategy and policy through relevant meetings and regional planning groups
ADOPT ICAO WRC POSITION IN NATIONAL DELIBERATIONS	Undertaking to provide for aviation interests to be fully integrated in the development of their positions, to the extent possible, material consistent with the ICAO Position
SUPPORT ICAO POSITION AT ITU WRCs	Supporting the ICAO position and the ICAO policy at ITU WRCs
PARTICIPATE IN NATIONAL AND REGIONAL SPECTRUM PROCESS	Undertaking to provide civil aviation experts to fully participate in the development of States' and regional positions and development of aviation interests at the ITU
REPRESENT AVIATION INTERESTS IN NATIONAL SPECTRUM DELEGATION	Ensuring their delegations to regional conferences, ITU study groups and WRCs include experts from their civil aviation authorities and other civil aviation stakeholders who are fully prepared to represent aviation interests
CONSIDER PUBLIC AND AVIATION SAFETY - ALSO WHEN ENABLING NEW NON-AVIATION SERVICES	Consider as a priority, public and aviation safety when deciding how to enable new or additional services, and to consult with aviation safety regulators, subject matter experts and airspace users, to provide all necessary considerations and to establish regulatory measures to ensure that incumbent aviation systems and services are free from harmful interference

Assembly Resolution A41-7

Urges Member States, international organizations and other civil aviation stakeholders to support firmly the ICAO frequency spectrum strategy and the ICAO position at WRCs and in regional and other international activities conducted in preparation for WRCs, including by the following means:

Requests the Secretary General to bring to the attention of ITU the importance of adequate radio frequency spectrum allocation and protection for the safety of aviation; and

Instructs the Council and the Secretary General, as a matter of high priority within the budget adopted by the Assembly, to ensure that the resources necessary to support the development and implementation of a comprehensive aviation frequency spectrum strategy as well as increased participation by ICAO in international and regional spectrum management activities are made available

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

At 41st ICAO Assembly, an initial Draft Deliverable:

Draft Global Concept for Integrated CNS and Spectrum

introduced through A41-WP/58

https://www.icao.int/Meetings/a41/Documents/WP/wp_058_en.pdf
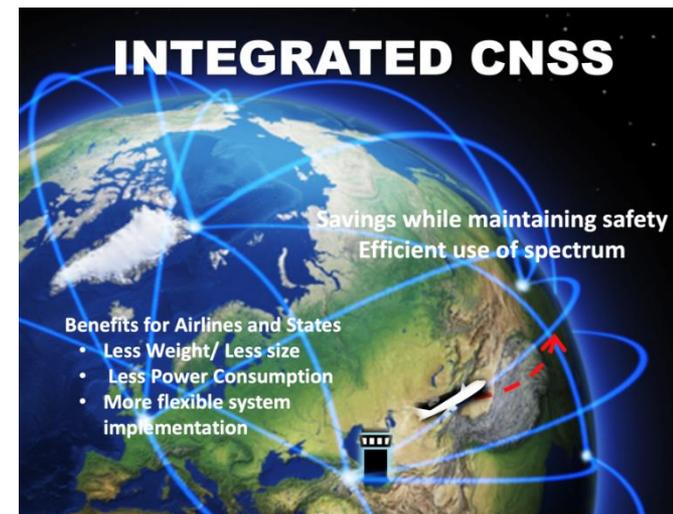
Long Term Evolution of CNS and Spectrum matters

- 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

41st ICAO Assembly (27 Sep – 7 Oct 2022), Proposed Actions:

Standardization

- Continue the evolution and improvement of the Standards-making process in order to be aligned with the global best practices, considering a structured, sustainable, and systematic process of improving its regulatory governance.
- Continue its work on the development and implementation of performance-based Standards and Recommended Practices (SARPs) and on guidance material to promote their implementation in support of innovative and emerging technologies.
- Continue to develop and finalize a new streamlined framework for CNS and frequency spectrum standardization, considering the perspectives expressed, including the importance of transparency and consultation with Member States.
- Underscore the importance of a mechanism and engagement from industry to ensure the foreseen ICNSS roadmaps and concepts to be addressed across all ICAO activities.

Integrated CNS and spectrum (ICNSS)

- Refer to the appropriate expert group the optimization of certain Standards-making processes related to the ICNSS project.

28

ICAO
Headquarters
Montréal

European and
North Atlantic
(EUR/NAT) Office
Paris

Asia and Pacific
(APAC) Sub-office
Beijing

Middle East
(MID) Office
Cairo

Western and
Central African
(WACAF) Office
Dakar

North American
Central American
and Caribbean
(NACC) Office
Mexico City

Asia and Pacific
(APAC) Office
Bangkok

South American
(SAM) Office
Lima

Eastern and
Southern African
(ESAF) Office
Nairobi

ICAO

Thank You!

More information: Frequency Spectrum Management Panel (FSMP)
https://www.icao.int/safety/FSMP