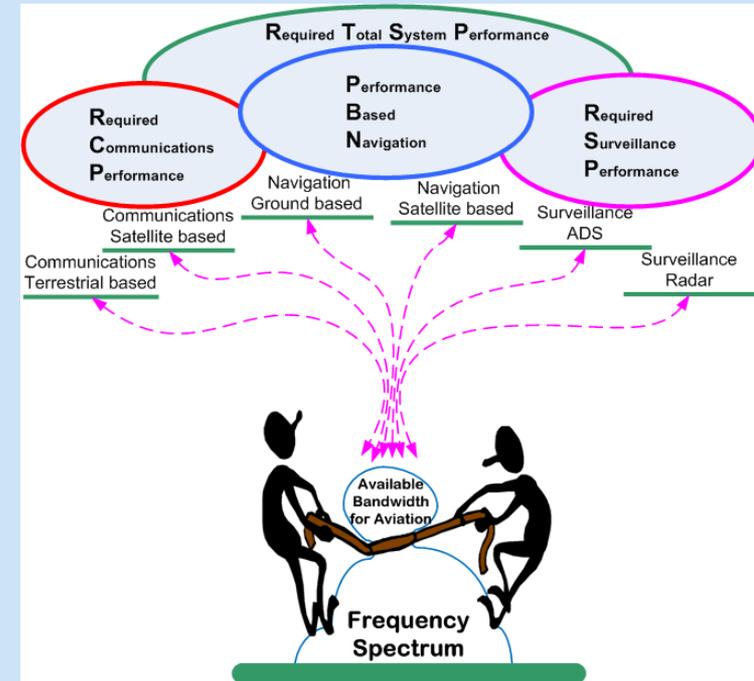




Aviation Frequency Spectrum and the ITU World Radiocommunication Conferences (WRC)



Aeronautical Spectrum Workshop

Preparation for WRC-15

Cairo, Egypt, 16 – 17 February 2015

Loftur Jónasson
ICAO

Overview



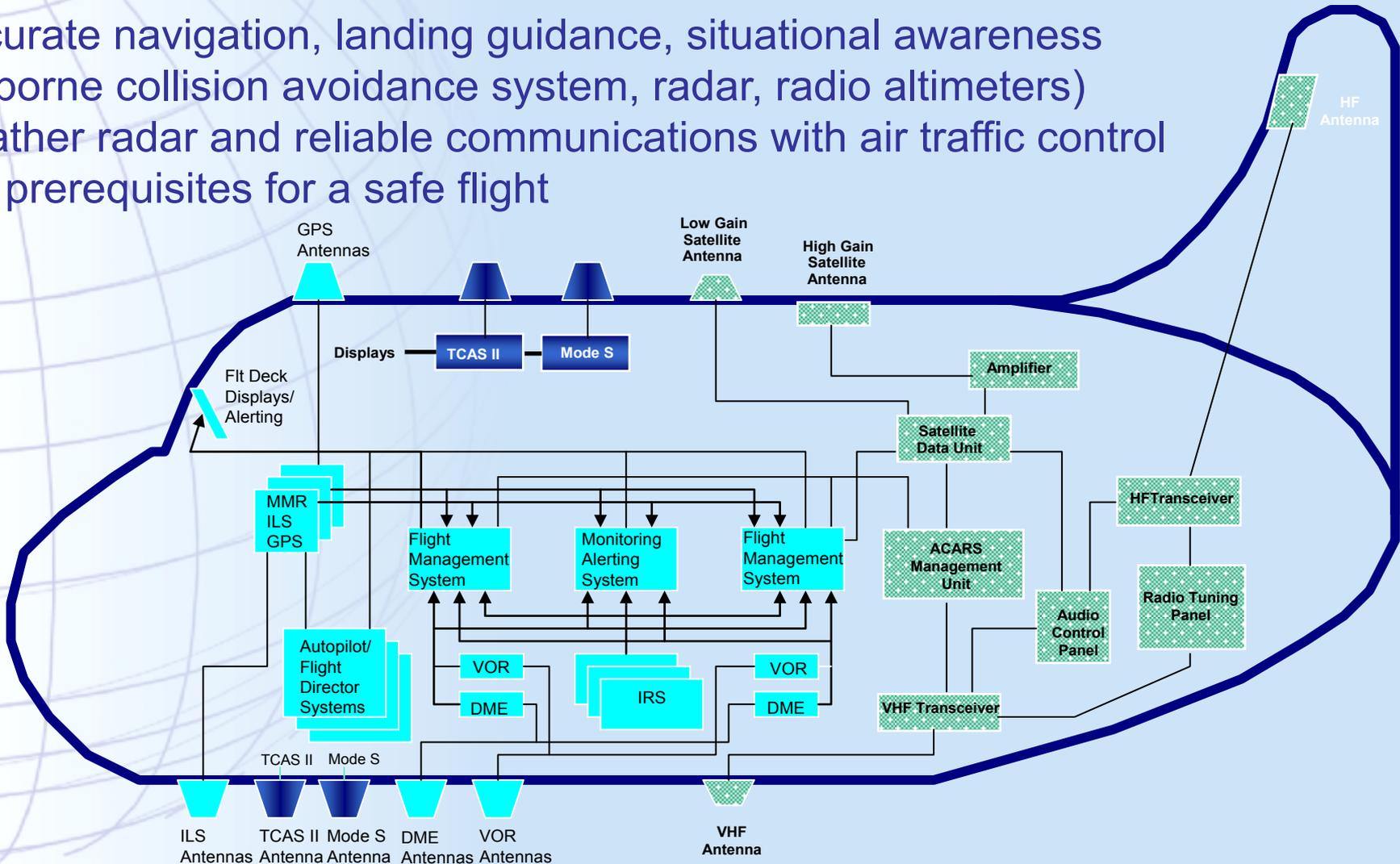
- **Aeronautical Spectrum Management (10)**
- **ITU in brief (Radio Regulations) (3)**
- **ITU World Radio Conferences (WRCs), General Overview (2)**
- **WRC-12 Results (4)**
- **Preparation for a WRC, Assembly Resolution A36-25, AN-Conf/12 Recommendations (7)**
- **WRC-15 Position, Policy & Strategy (4)**
- **WRC-15 Preparation (5)**

Separate presentation on Global Tracking, including ITU PP-14 resolution and outcome of ICAO High Level Safety Conference, 2-5 February

Aeronautical Frequency Spectrum Management



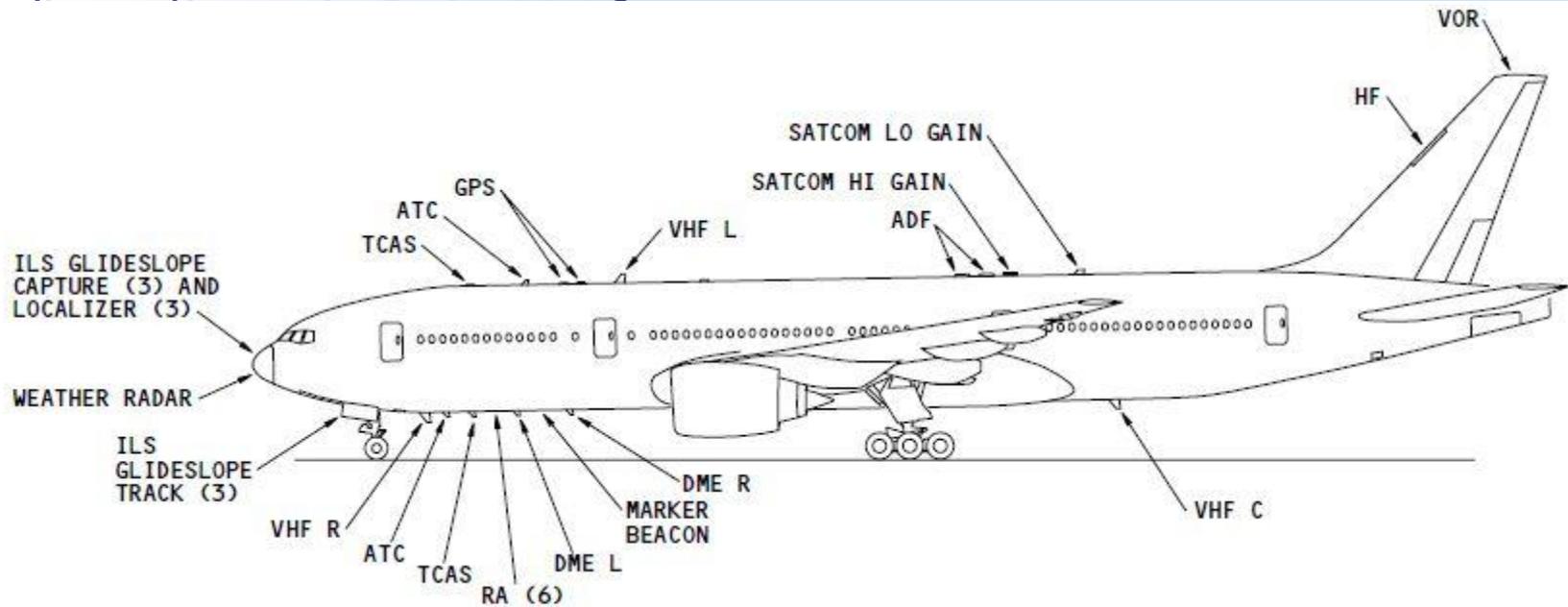
Accurate navigation, landing guidance, situational awareness (airborne collision avoidance system, radar, radio altimeters) weather radar and reliable communications with air traffic control are prerequisites for a safe flight



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

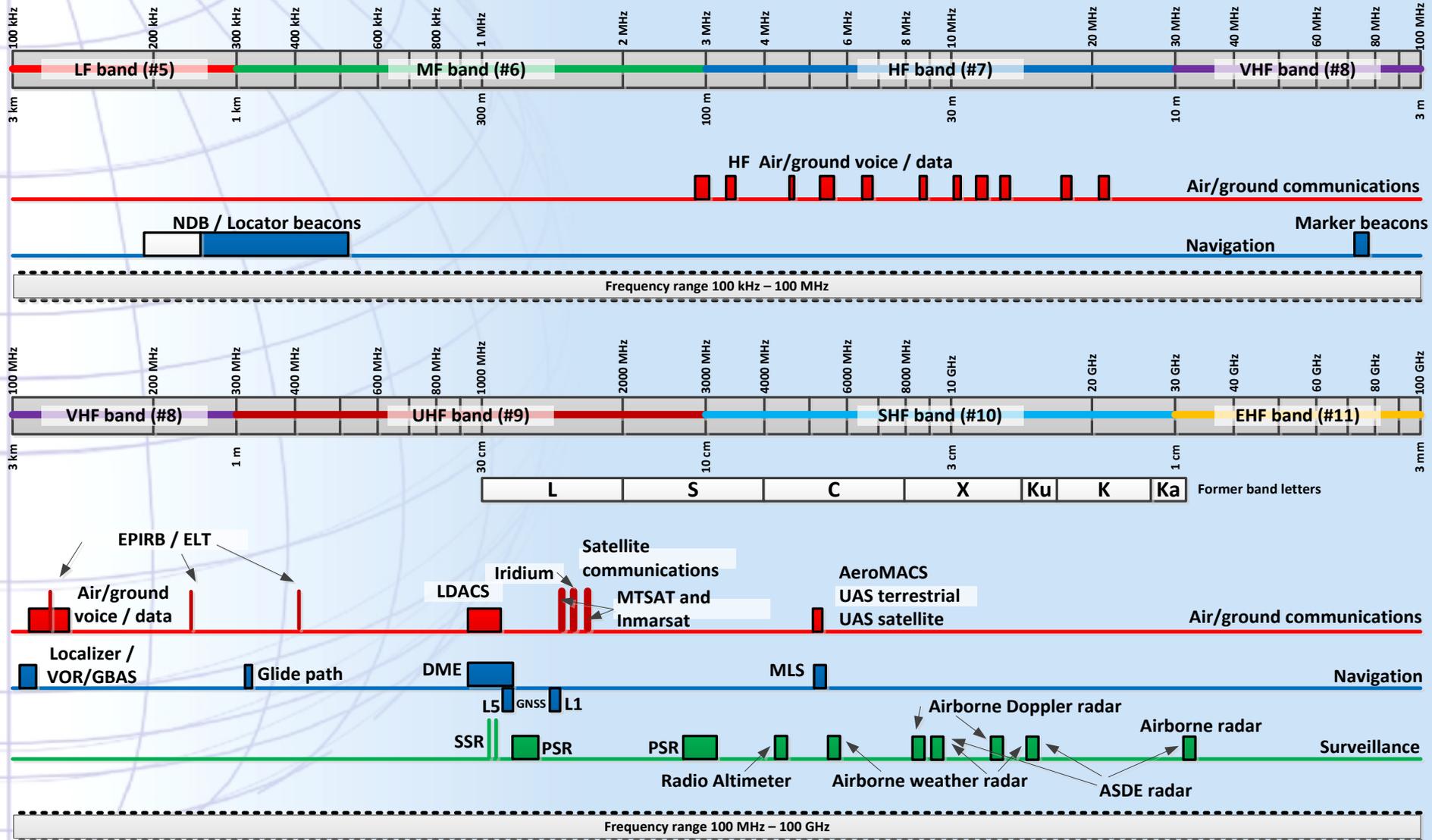


777 GENERAL - ANTENNA LOCATIONS

Aeronautical Frequency Spectrum Management



Overview of spectrum allocations to aeronautical services utilized by Civil Aviation



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

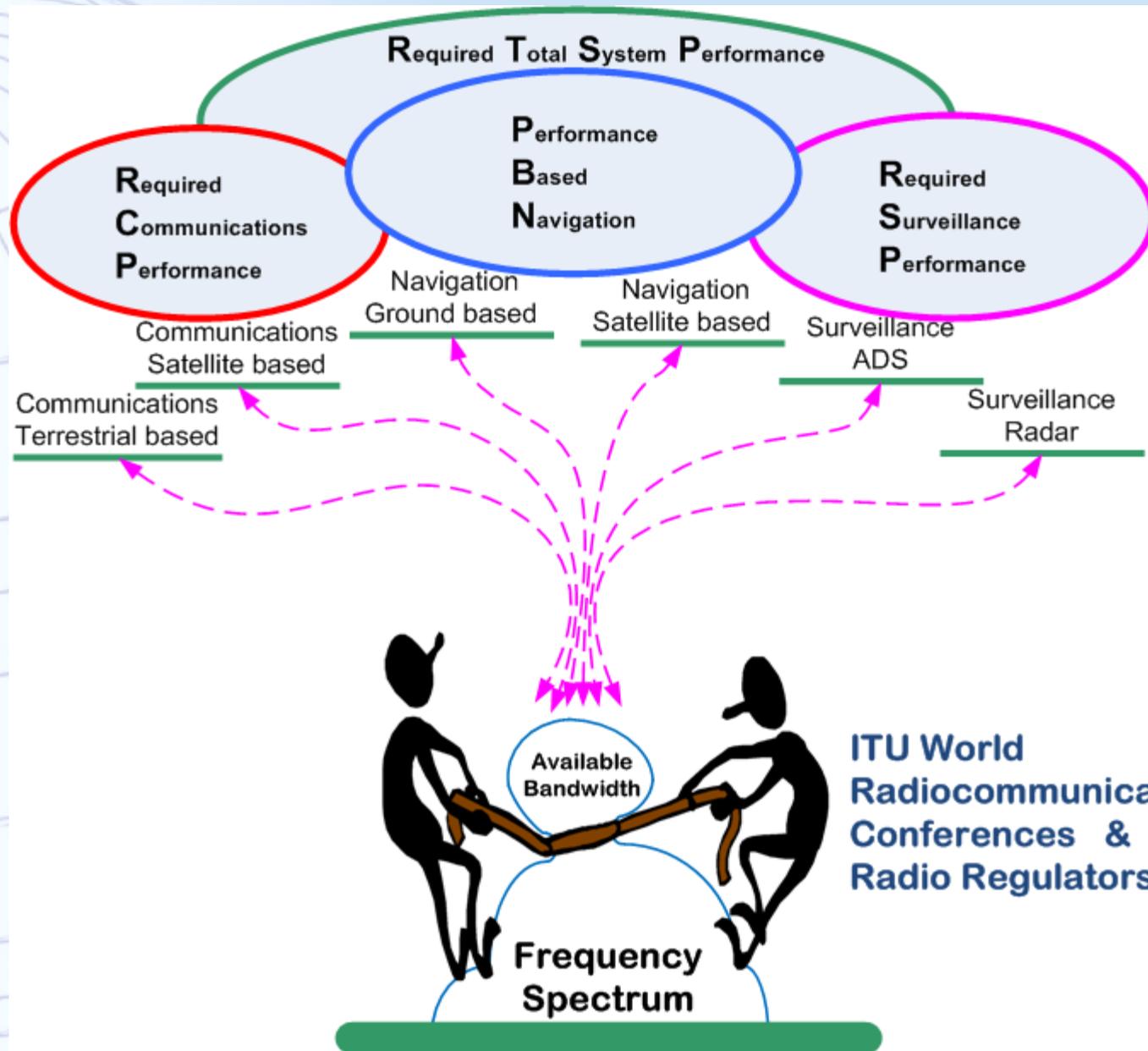


Aeronautical Frequency Spectrum Management



Air Transport is a rapidly growing industry:

- World wide consistent growth 1970 – 2015
 - ✓ 4.6% per year.
 - ✓ Doubles every 15 years
- If aviation were a country, it would rank 21st in the world in terms of gross domestic product (GDP)



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, which are contained in the ITU Radio Regulations (RR)
- This includes maintenance of the Table of Frequency Allocations
- A consequence of this is that aviation frequency managers need to develop, and lobby for an aviation position on frequency spectrum use



Aeronautical Frequency Spectrum Management



Co-ordination of aviation position for ITU World Radiocommunication conferences

➤ At the national level:

- National position is developed and co-ordinated by the National Frequency Spectrum authority. Aviation is but one of many elements that lobby for attention



➤ At the 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

➤ At the international level:

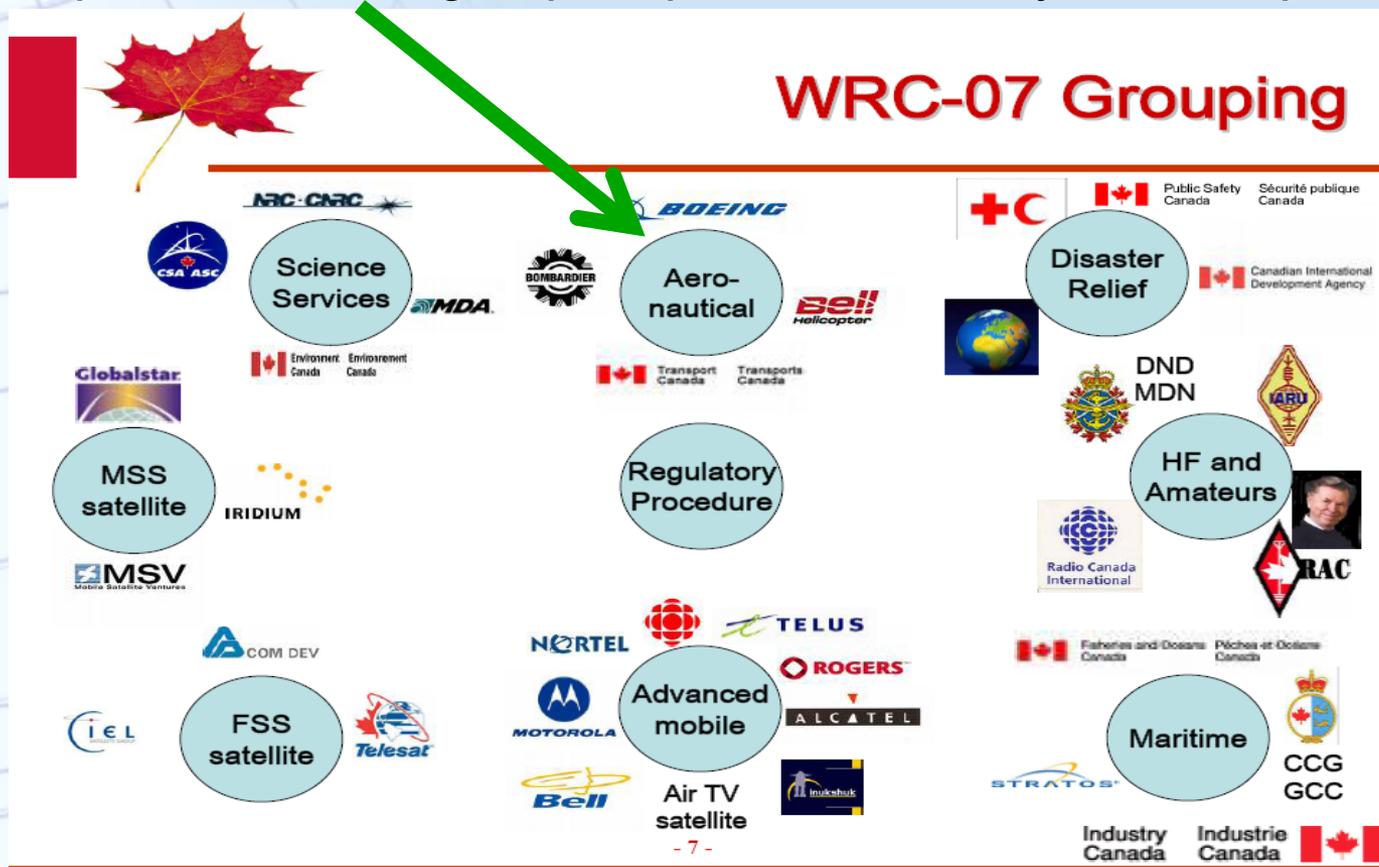


- National telecommunications authorities (and Regional) co-ordinate their position through the ITU-R Study Groups. Although aviation may be represented in the national delegations, they may not be allowed to speak up, as the national delegation has only “one official position”. States look to ICAO for guidance on aviation matters

Aeronautical Frequency Spectrum Management



A slide borrowed from Industry Canada shows a good example of the many “special interest” groups represented in any national position.



Aeronautical Frequency Spectrum Management



The ITU Radio Regulations update cycle

- A very competitive environment
- Neutral to Aviation
- 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

ITU in brief



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

- Based in Geneva, Switzerland
- Founded on 17 May 1865
- 193 Member States, more than 700 Sector members and associates
- ~960 staff, ~80 nationalities



ITU in brief

Radio Regulations



■ International treaty:

- Facilitate equitable access to and rational use of the radio frequency spectrum and the geostationary orbit
- Ensure availability and protection from harmful interference of frequencies for distress and safety 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



ITU in brief

Radio Regulations



■ Contents of the Radio Regulations:

A set of regulatory provisions addressing the major topics of:

- Definitions for services and technical features related to spectrum and frequency planning
- Frequency Allocations to services
- Procedures for coordination and registration of frequencies
- Provisions for distress and safety communications
- Provisions for individual radio services (including Aeronautical Services)
- Interference – reporting and clearance
- Administrative provisions, including licensing

Together with:

- Appendices (30) addressing planning, technical parameters and operational procedures
- Resolutions and Recommendations



ITU WRCs

General Overview



- WRCs update the International Radio Regulations
- Held every 4 years
 - **Last was in Jan/Feb 2012**
 - **Next in Nov 2015**
- Main purposes:
 - **To revise the Radio Regulations (RR); and**
 - **To address Radiocommunication issues of a worldwide character.**
- Radio Regulations: International treaty governing the use of the Radio Frequency Spectrum
- Why participate at World Radiocommunication Conferences:
 - To protect existing services
 - To obtain access to spectrum for new services and enhance spectrum access for existing services
 - To facilitate market access for radio equipment manufacturers; and
 - To provide regulatory certainty to operators.



ITU WRCs

WRC-12 in numbers



- **Participation: 3100 delegates**
- **Budget of ~\$5.7 million US Dollars**
- **4 weeks (5 ½ weeks counting RA-12 and CPM)**
 - **165 Administrations**
 - **5 regional telecommunication organizations**
 - **4 intergovernmental organizations**
 - **4 UN specialized agencies (UN, ICAO, IMO, WMO)**
 - **>80 other international/regional, scientific and industrial agencies or organizations.**

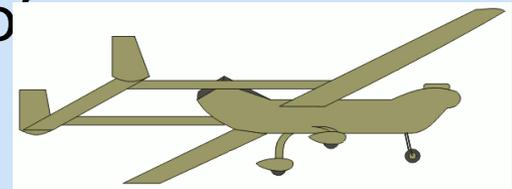
- **1255 meetings, over 50 meetings/day, including weekends. Marathon overnight sessions.**
- **Over 26.000 documents, 2.000.000 downloads, 3.500 hours of interpretation in 6 languages. Over 10.000 pages translated during the conference.**



WRC-12: Main results for Civil Aviation (1)



- Spectrum to support the safe operation of UAS in non-segregated airspace.



- A new allocation agreed to the AM(R)S in the 5 GHz band
- An existing allocation to the AMS(R)S in the 5 GHz band was modified to be limited to internationally standardized aeronautical systems.



WRC-12: Main results for Civil Aviation (2)



- Increased flexibility of existing aeronautical allocations
- A task that started prior to WRC-03 was finalized. Gives flexibility to support GBAS and future technologies such as LDACS and AeroMACS.

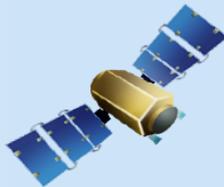
NextGen
&
SESAR



WRC-12: Main results for Civil Aviation (3)



- Priority and pre-emption for the Aeronautical Mobile Satellite (route) Service (AMS(R)S) in certain Mobile Satellite Service (MSS) bands at 1.5 and 1.6 GHz.
- An uphill battle since WRC-97 was (mostly) resolved. At WRC-97 aviation had lost its exclusive access to these bands.



WRC-12: Main results for Civil Aviation (4)



In general, conference results conformed to the ICAO Position. Major factors contributing to this include:

- Early development and dissemination of the draft ICAO Position
- Active participation by national aviation experts and ICAO in the preparatory work of the ITU, including the relevant meetings of the ITU-R
- ICAO participation (from HQ and regional offices) in meetings of the regional telecommunication organizations
- Increased awareness in the Regions through ACP WG-F (now FSMP) meetings and ICAO Radio Frequency Seminars in the Regions
- Active Participation of the ICAO Delegation at WRC-12 allowed ICAO to counter and refute proposals which would have adversely impacted aeronautical spectrum



WRC Preparation (1)

- **Strategy for establishing and promoting the ICAO Position for future ITU WRCs - ICAO Doc 9718, Vol I, Attachment E**
 - ICAO Position is established as early as possible after the agenda for that WRC is established
 - The Position presents ICAO views on all agenda items of interest to international civil aviation on the agenda of the WRC, with particular regard to the impact on safety, regularity and efficiency of flight
 - Focal point on all aspects related to the development of the ICAO Position is the [new] Frequency Spectrum Management Panel (WG-F)
 - Proper co-ordination with ICAO Regional Offices (Bangkok, Cairo, Dakar, Lima, Mexico, Nairobi, Paris)





WRC Preparation (2)

- Position reviewed by ANC, sent to States and relevant International Organizations for comments, and a consolidated ICAO Position is submitted to ANC and Council for approval
- Position is sent to States for use in the States' own internal coordination process, when developing national positions
- Following development of the Position, consequential amendments to Spectrum Strategy and Policy Statements are developed for approval by the Council
- Subsequent developments arising from ICAO and ITU activities in preparation for the WRC are considered by the Council with a view to update the Position as necessary



WRC Preparation (3)

- **Guidance for the promotion of the ICAO position**
 - Assembly Resolution A38-6 shall be fully implemented so as to secure support from States to the ICAO Position and ensure that the resources necessary to support increased participation by ICAO to international and regional spectrum management activities are made available.
 - ICAO contributes to the WRC preparatory activities conducted by ITU and Regional Telecommunications Organizations, by submitting additional technical papers supporting the ICAO Position
 - ICAO maintains close co-ordination and co-operation with other aviation organizations participating in the Conference, such as IATA
 - Regional ICAO co-ordination meetings to present and discuss the ICAO Position should be organized as required. These meetings to be held in conjunction with meetings of FSMP (ACP WG-F)

WRC Preparation (4)



(part 1)

Assembly Resolution A38-6

- ✓ *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:*
 - a) working together to deliver efficient aeronautical frequency management and “best practices” to demonstrate the effectiveness and relevance of the aviation industry in spectrum management;
 - b) supporting ICAO activities relating to the aviation frequency spectrum strategy and policy through relevant expert group meetings and regional planning groups;
 - c) undertaking to provide for aviation interests to be fully integrated in the development of their positions presented to regional telecommunications fora involved in the preparation of joint proposals to the WRC;
 - d) including in their proposals to the WRC, to the extent possible, material consistent with the ICAO Position;

WRC Preparation (5)



Assembly Resolution A38-6

(part 2)

- e) supporting the ICAO position and the ICAO policy statements at ITU WRCs as approved by Council and incorporated in the *Handbook on Radio Frequency Spectrum Requirements for Civil Aviation* (Doc 9718);
 - f) 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; and
 - g) ensuring, to the maximum extent possible, that 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;
- ✓ *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.

WRC Preparation (6)



12th Air Navigation Conference (Nov 2012)

- Held approx every 10 years
- Primary goal is to ensure coherent and harmonized ATM modernization and implementation in order to keep air transportation safe, reliable and efficient
- Main theme of conference was redrafting of the Global Air Navigation Plan (GANP), based on the concept of Aviation System Block Upgrades.

WRC Preparation (7)



12th Air Navigation Conference (Nov 2012)

- Spectrum related Recommendations by the Conference:
 - 1/8 Rationalization of Radio Systems
 - 1/12 Development of the aeronautical frequency spectrum resource
 - 1/13 Potential use of fixed satellite service spectrum allocations to support the safe operation of remotely piloted aircraft systems
 - 1/14 Long-term very small aperture terminal spectrum availability and protection



WRC 2015 Position, Policy and new Spectrum Strategy (1)

- ICAO Position was developed by ACP WG-F in 2012, reviewed by the Air Navigation Commission and sent to States for comments (Nov 2012)
- Position finalized by ACP WG-F in March 2013, based on feedback from States – for subsequent final review by the Air Navigation Commission in April 2013.
- Position approved by ICAO Council by end of May 2013 and disseminated to States and International Organizations
- Updates to the Position to be developed by FSMP/WG-F/32 this week, to bring in line with the results of preparatory studies for WRC-15.
- Any eventual updates will be approved by Council in time for WRC-15



WRC 2015 Position, Policy and new Spectrum Strategy (2)



ICAO Policy Statements

- A WRC is limited to certain issues and certain frequency bands. The ICAO position only addresses spectrum usage in context with issues identified in the pre-set WRC agenda.
- The ICAO **Policy Statements** however, indicate **overall ICAO policy for each and every frequency band** used by aviation safety services
- The Policy Statements are “**Official ICAO Policy**”, **approved by Council**. Latest revision of the policy statements was done together with the development of the ICAO Position.
- **Included in Doc 9718, the “Handbook on Radio Frequency Spectrum Requirements for Civil Aviation”** (latest revision is Rev 5, published in 2010, Draft Rev 6 is available on ACP Website)

WRC 2015 Position, Policy and new Spectrum Strategy (3)



Spectrum Strategy (as per AN-Conf/12 Recommendation 1/12)

- e) develop and implement a comprehensive aviation frequency spectrum strategy to be referenced to the GANP, which includes the following objectives:
- 1) 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
 - 2) demonstrate efficient use of the spectrum allocated through efficient frequency management and use of best practises; and
 - 3) clearly state in the strategy the need for aeronautical systems to operate in spectrum allocated to an appropriate aeronautical safety service;

WRC 2015 Position, Policy and new Spectrum Strategy (4)



How does this hang together?

➤ **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 A38-6)

WRC 2015 preparation (1)



Project: Secure and maintain the aeronautical frequency spectrum at ITU WRC 2015

- FSMP (ACP) Working Group F to meet in the Regions / Regional Aviation Frequency Spectrum Seminars, 2 two-week missions per year
- ICAO Secretariat (HQ) to participate in relevant ITU-R Study Groups: WP5B / WP4A/4C / JTG-4-5-6-7, up to 6 two-week missions per year
- ICAO Secretariat (HQ / Regional) to participate in meetings of regional telecommunications organizations, 2 – 4 one-week missions per year
- In 2015, participation in WRC-2015, 3 ICAO Officers, 4 weeks.

✓ **Dependency:** ICAO Budget

WRC 2015 preparation (2)



WRC 2015 Agenda Items

- 30 Agenda Items total
- 15 Agenda Items affect aviation in a positive or negative manner



WRC 2015 preparation (3)



Development of Aviation Spectrum (main Agenda Items):

➤ Agenda Items 1.5:

- To consider the use of frequency bands allocated to the fixed-satellite service not subject to Appendices 30, 30A and 30B for the control and non-payload communications of unmanned aircraft systems (UAS) in non-segregated airspaces, in accordance with Resolution 153 (WRC-12)

➤ Agenda Item 1.7:

- To review the use of the band 5091 – 5150 MHz by the fixed satellite service (Earth-to-space) (limited to feeder links of the non-geostationary mobile-satellite systems in the mobile-satellite service) in accordance with Resolution 114 (Rev. WRC-12)

➤ Agenda Item 1.17

- To consider possible spectrum requirements and regulatory actions, including appropriate aeronautical allocations, to support wireless avionics intra-communications (WAIC), in accordance with Resolution 423 (WRC-12)

➤ Agenda Item 9.1.5

- Consideration of technical and regulatory actions in order to support existing and future operation of fixed-satellite service earth stations within the band 3400 – 4200 MHz, as an aid to the safe operation of aircraft and reliable distribution of meteorological information in some countries in Region 1 (Resolution 154 (WRC-12))

WRC 2015 preparation (4)



Direct Threats to Aviation Spectrum (main Agenda Items):

- Agenda Item 1.1:
 - To consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution 233 (WRC-12)
- Agenda Item 1.5:
 - To consider the use of frequency bands allocated to the fixed-satellite service not subject to Appendices 30, 30A and 30B for the control and non-payload communications of unmanned aircraft systems (UAS) in non-segregated airspaces, in accordance with Resolution 153 (WRC-12)
- Agenda Item 1.12:
 - To consider an extension of the current worldwide allocation to the Earth exploration-satellite (active) service in the frequency band 9300 – 9900 MHz by up to 600 MHz within the frequency bands 8700 – 9300 MHz and/or 9900 – 10500 MHz, in accordance with Resolution 651 (WRC-12)
- Agenda Items 1.6, 1.10, 1.11 and 1.16...

WRC-15 Main Thrust



Mobile Broadband Communications

Additional spectrum to be identified for Mobile Broadband

- Today, an expanding range of “smart” portable devices,
- New and very bandwidth demanding over-the air applications, Skype, video on demand, etc...



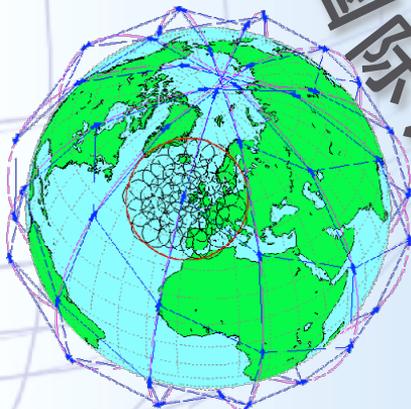
Definition of Radio Frequency Management:

“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

Thank You!



Overview

Aeronautical Spectrum Management	(10)
ITU in brief (Radio Regulations)	(3)
ITU World Radio Conferences (WRCs), General Overview	(2)
WRC-12 Results	(4)
Preparation for a WRC, Assembly Resolution A36-25, AN-Conf/12 Recommendations	(7)
WRC-15 Position and Policy	(4)
WRC-15 Preparation	(5)