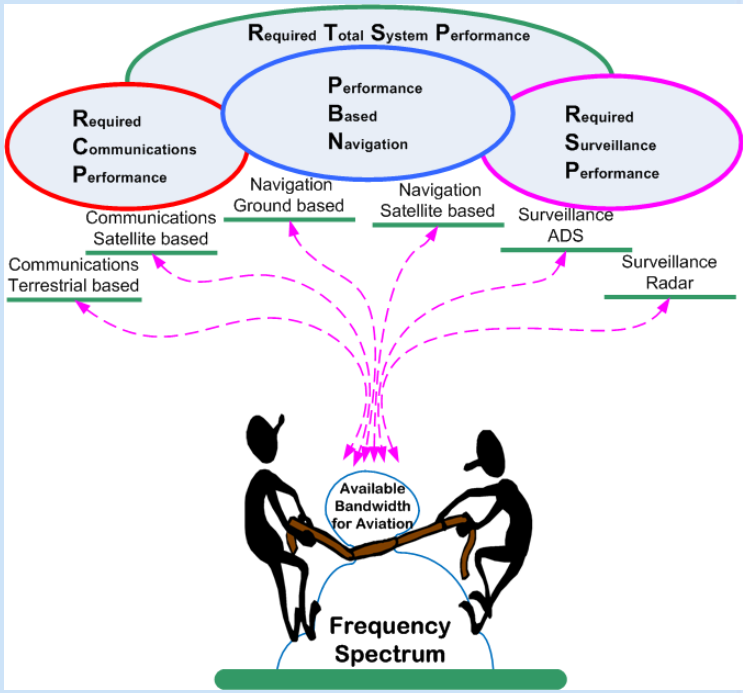
Aviation Frequency Spectrum and the ITU World Radiocommunication Conferences (WRC)



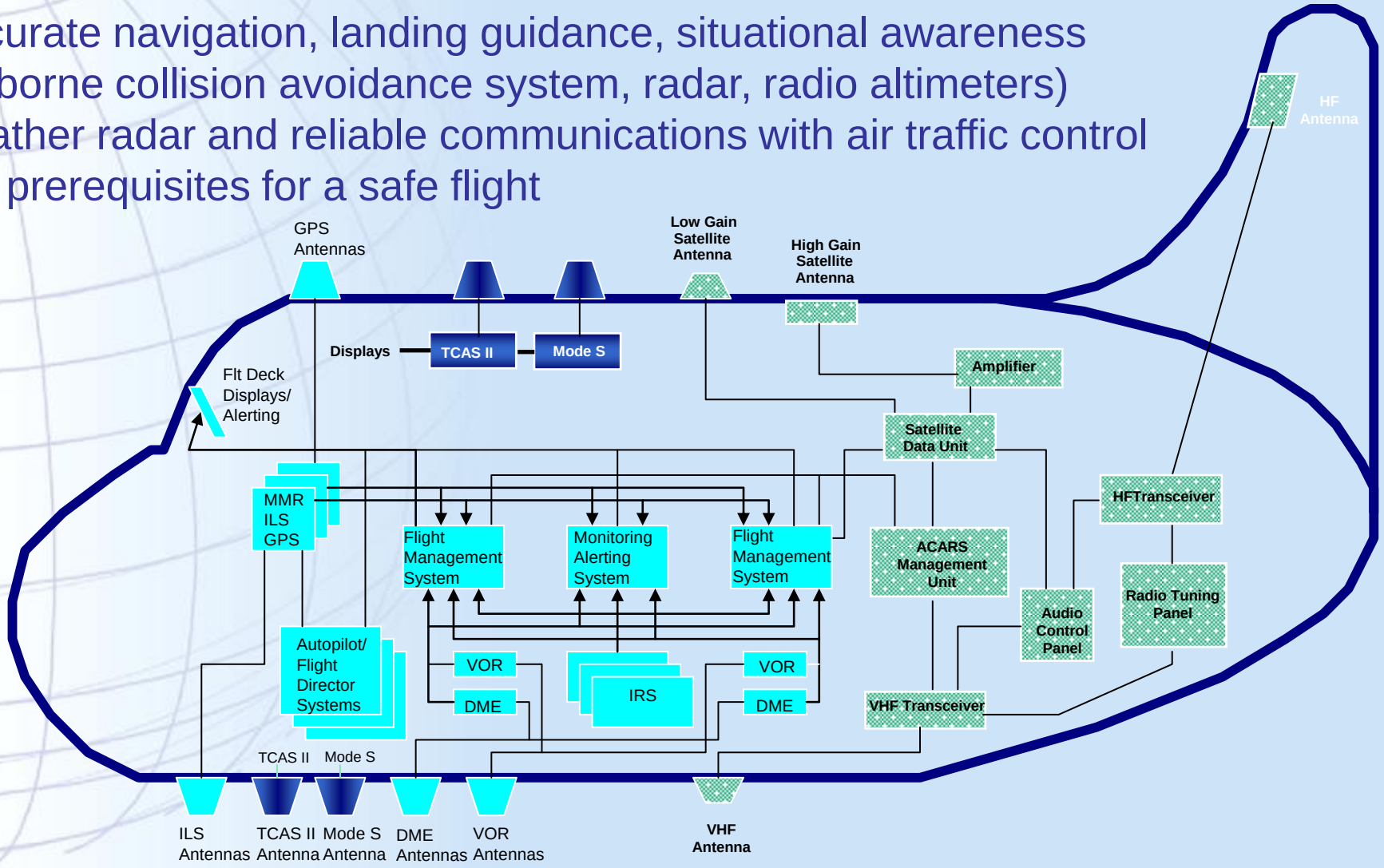
Preparation for WRC-15

Montreal, 6 October 2015

Loftur Jónasson
ICAO

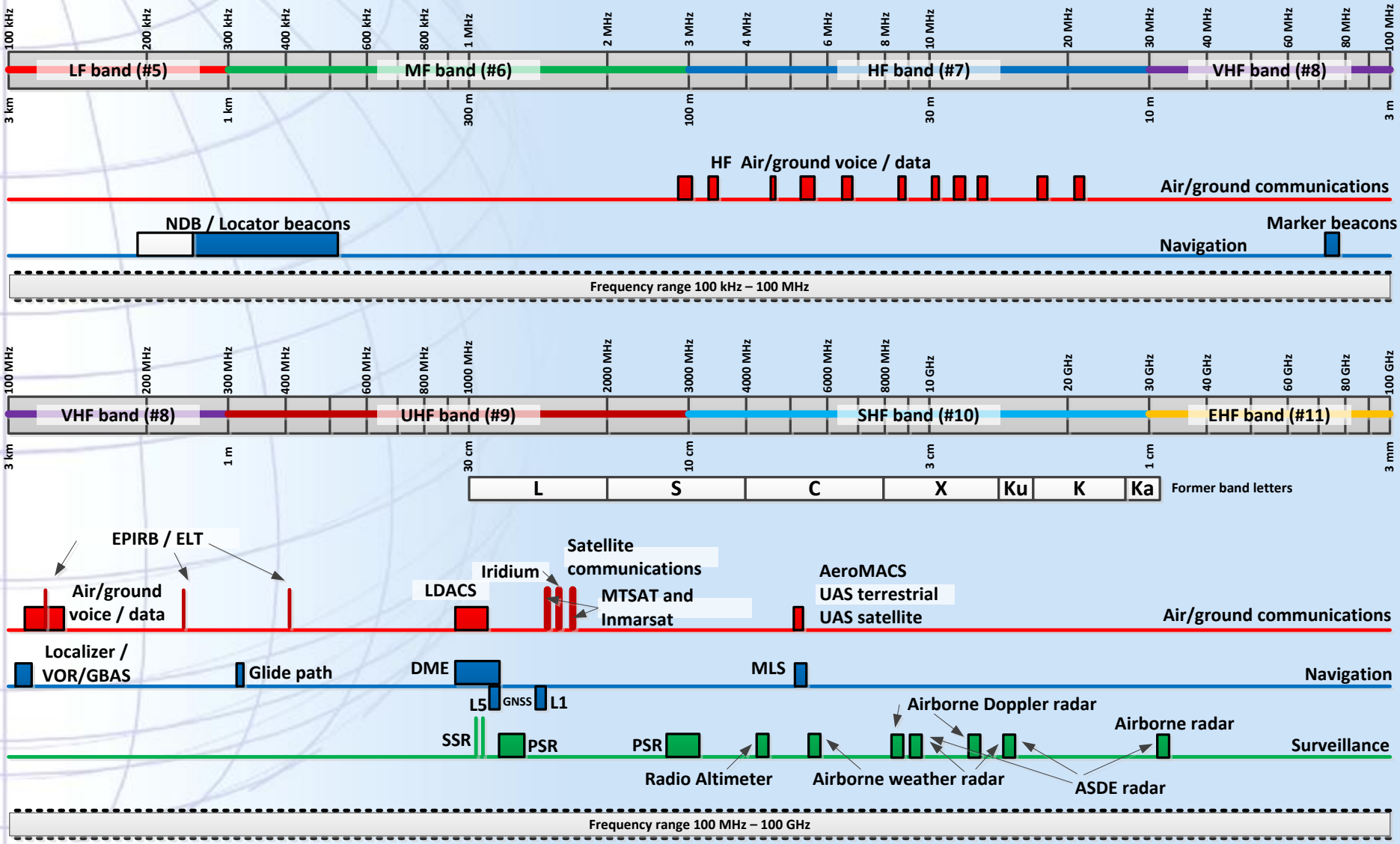
Aeronautical Frequency Spectrum Management

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



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)

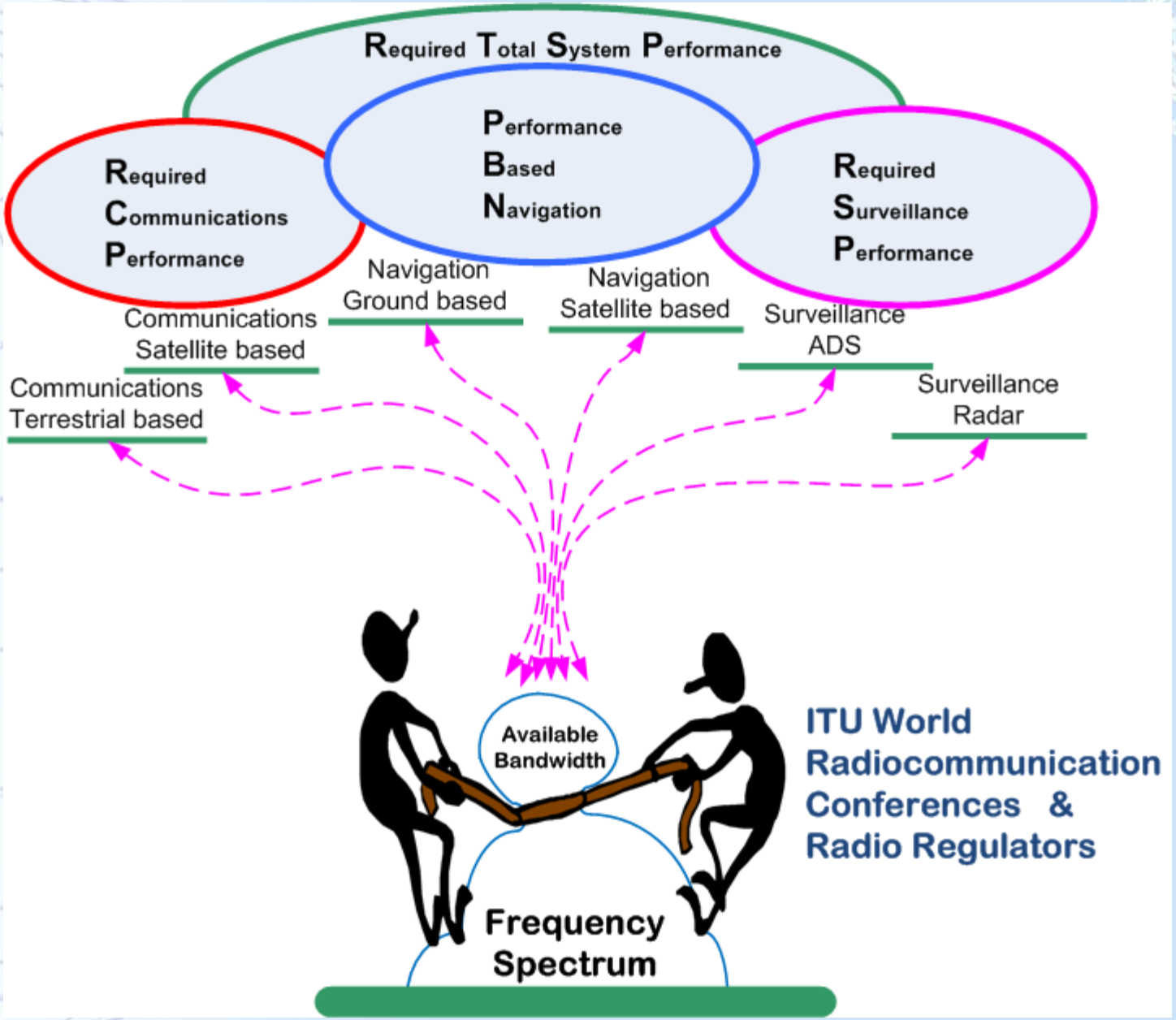
Aeronautical Frequency Spectrum Management

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)

Source for statistics: Air Transport Action Group (ATAG)


Required Total System Performance
Performance Based Navigation
Required Communications Performance
Required Surveillance Performance
Navigation Ground based
Navigation Satellite based
Communications Satellite based
Communications Terrestrial based
Surveillance ADS
Surveillance Radar
Available Bandwidth
Frequency Spectrum
ITU World Radiocommunication Conferences & Radio Regulators

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

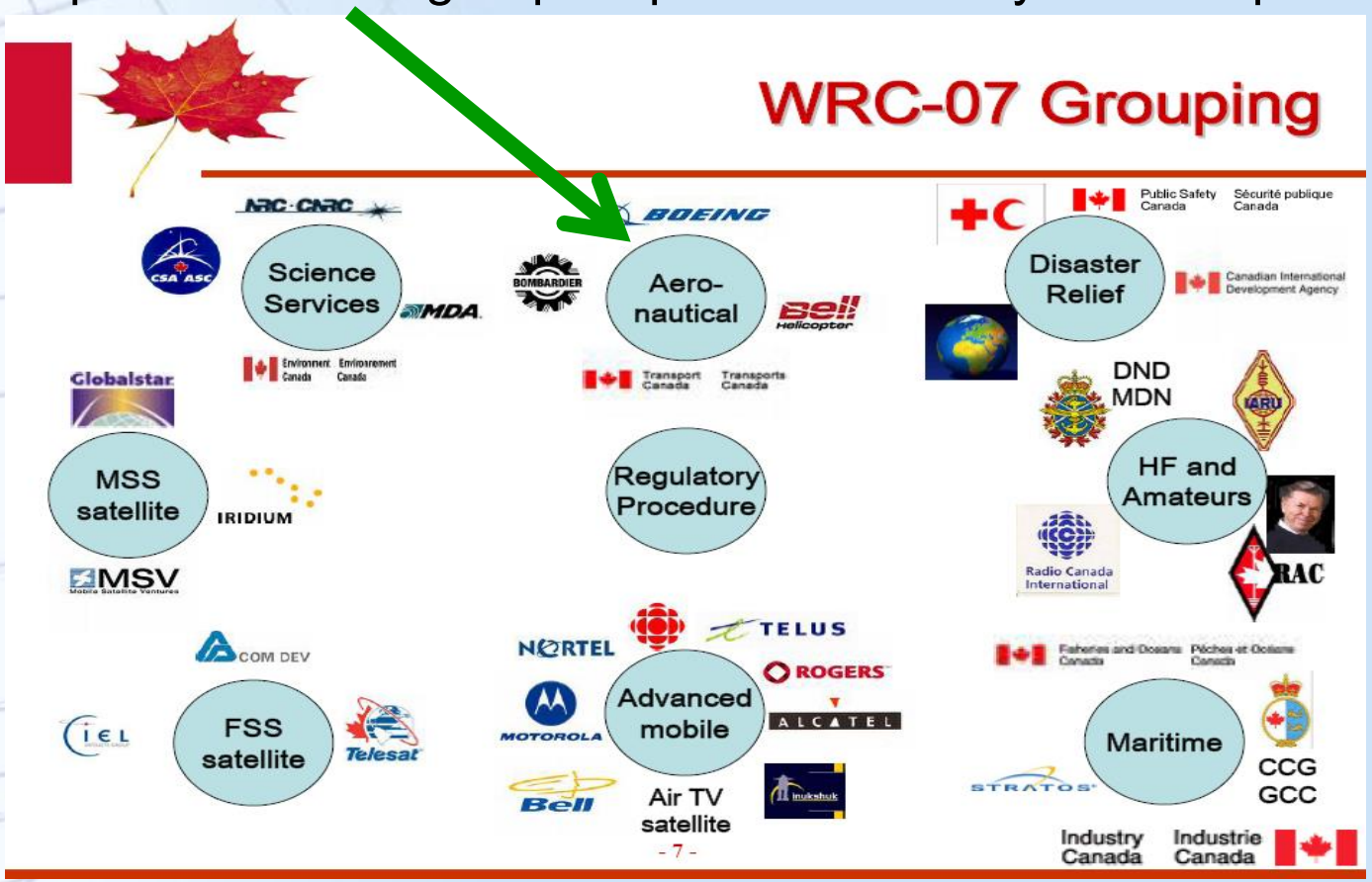
Aeronautical Frequency Spectrum Management

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 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 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 Managenet 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

WRC 2015 Position

- ICAO Position was developed by ACP WG-F (now FSMP) in 2012, reviewed by the Air Navigation Commission and sent to States for comments (Nov 2012)

- Position finalized in March 2013, based on feedback from States for subsequent final review by the ICAO 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 developed by FSMP and approved by Council in June 2015 - to bring in line with the results of preparatory studies for WRC-15.

Spectrum Strategy

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 Agenda Items

WRC 2015 Agenda Items

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

WRC 2015 Opportunities

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 1.17
  - 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))
- Global Flight Tracking (as per ITU PP-14 decision)
  - ✓ Consideration of Global Flight Tracking, including, if appropriate, and consistent with ITU practices, various aspects of the matter, taking into account ITU-R studies.

WRC 2015 Threats

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 2015 Agenda Item 1.1 (1 of 2)

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);

ICAO Position:

- **To oppose any new allocation to the mobile service for IMT in or adjacent to:**
- **- frequency bands allocated to aeronautical safety services (ARNS, AM(R)S, AMS(R)S);**
- **- frequency bands allocated to RNSS and used for aeronautical safety applications; or**
- **- frequency bands used by fixed satellite service (FSS) systems for aeronautical purposes as part of the ground infrastructure for transmission of aeronautical and meteorological information or for AMS(R)S feeder links,**
- **unless it has been demonstrated through agreed studies that there will be no impact on aeronautical services. *(continued)***

400 – 406 MHz	**ELT**
960 – 1215 MHz	**DME, SSR, 1090ES, MLAT, ACAS, UAT, GNSS, LDACS**
1215 – 1350 MHz	**PSR**
1559 – 1610 MHz	**GNSS**
1.5 / 1.6 GHz	**AMS(R)S (sub-bands)**
2700 – 3100 MHz	**PSR (airport approach)**
3400 – 4200 MHz	**FSS used extensively in the Asia Pacific region for aeronautical ground-ground communications carrying safety critical data (VSAT). See also Agenda Item 9.1.5.**
4200 – 4400 MHz	**Radio Altimeters**
5000 – 5250 MHz	**MLS, UAS Terrestrial & Satellite, AeroMACS, Aeronautical Telemetry**
5350 – 5470 MHz	**Airborne Weather Radar**

…

WRC 2015 Agenda Item 1.1 (2 of 2)

ICAO Position (continued):

- **Due to the potential for serious impact to aeronautical radar systems, global and/or regional allocations to the mobile service for IMT, and/or identification for IMT, should be opposed in any portion of the potential candidate frequency bands/ranges 1 350 - 1 400 MHz and 2 700 - 2 900 MHz. Allocations/identifications on a country/multi-country basis should be contingent on successful completion of coordination with countries within several hundred kilometres of the IMT proponent country's border.**
- **Any new allocations to the mobile service for IMT, and/or identification for IMT, in frequency bands/ranges near that used by radio altimeters (4 200 - 4 400 MHz) should be contingent on successful completion of studies to demonstrate that IMT operations will not cause harmful interference to the operation of radio altimeters.**

400 – 406 MHz	ELT
960 – 1215 MHz	DME, SSR, 1090ES, MLAT, ACAS, UAT, GNSS, LDACS
1215 – 1350 MHz	PSR
1559 – 1610 MHz	GNSS
1.5 / 1.6 GHz	AMS(R)S (sub-bands)
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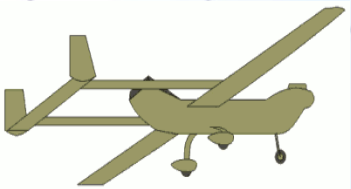
5350 – 5470 MHz	Airborne Weather Radar
…	

WRC 2015 Agenda Item 1.5 (1 of 2)

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);



Unmanned aircraft systems have great potential for innovative civil applications…

ITU Recommendation 724 (WRC-07) notes: "that the FSS is not a safety service;"

Control and non-payload communications (CNPC) of unmanned aircraft systems (UAS) is a "safety of life" issue for:

- ✓ **manned aircraft sharing the airspace**
- ✓ **life and infrastructure on the ground**

The ICAO Position (see next slide) includes a detailed set of conditions, required as-a-minimum, to ensure that safety of life concerns are sufficiently addressed, in order to make any consideration of FSS spectrum possible for UAS CNPC links

WRC 2015 Agenda Item 1.5 (2 of 2)

ICAO Position:

- **[…] to ensure that in order to support the use of FSS systems for UAS CNPC links in non-segregated airspace, the technical and regulatory actions identified by studies under Resolution 153 (WRC-12) be consistent with the above Recommendations, and satisfy the following conditions:**
- **1. That the technical and regulatory actions be limited to the case of UAS using satellites, as studied, and not set a precedent that puts other aeronautical safety services at risk.**
- **2. That all frequency bands which carry aeronautical safety communications be clearly identified in the ITU Radio Regulations.**
- **3. That the assignments and use of the relevant frequency bands be consistent with article 4.10 of the ITU Radio Regulations which recognizes that safety services require special measures to ensure their freedom from harmful interference.**
- **Additional conditions will need to be addressed in ICAO SARPs for UAS CNPC, and not in ITU.**
- **The provisions for UAS CNPC communications links to meet the necessary technical and operational requirements for any specific airspace in any particular frequency band will be addressed within ICAO.**

WRC 2015 Agenda Item on Global Flight Tracking

(Resolution 185 - Busan, 2014)

(PP-14)
[…]
resolves
to instruct WRC-15, pursuant to No. 119 of the ITU Convention;
to include in its agenda, as a matter of urgency, the consideration of global flight tracking, including, if appropriate, and consistent with ITU practices, various aspects of the matter, taking into account ITU-R studies

ICAO Position:

(GFT)

- **To support consideration of all possible options for support of ICAO global flight tracking as supported by studies. This should include:**
- **A new provision in the Earth-to-space direction only for an AMS(R)S allocation at 1 090 MHz for the satellite reception of existing aircraft ADS-B signals that operate in accordance with recognized international aeronautical standards under the condition that it not constrain existing aeronautical safety systems**
- **A future Conference (WRC-19) agenda item to address evolving GFT requirements.**

(Agenda Item 10)

- **To support the inclusion of an item on the agenda of a future World Radiocommunication Conference to address the needs of the global aeronautical distress and safety system.**

Definition of Radio Frequency Management:

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Thank You!