Update on Wireless Avionics Intra-Communications (WAIC)

ITU-R Update and Future Regulatory Considerations

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AVSI and WAIC

- What is the Aerospace Vehicle Systems Institute (AVSI)
  - *Aerospace Vehicle System Institute* - A cooperative of companies, academia and government agencies.
  - Focus on developing improved aerospace vehicles.
  - Creates an environment for collaboration on research and development projects; investigates emerging technologies; and influences standards and policies to promote cost effective systems development and certification.

- What is Wireless Avionics Intra Communications (WAIC)
  - Aviation industry’s effort to derive the benefits of wireless technologies for the future generation of commercial aircraft
  - Radiocommunication between two or more points on a single aircraft.
  - Part of a closed, exclusive network required for operation of the aircraft.
  - Does NOT provide air-to-ground, air to satellite, or air-to-air communications.
  - Only safety related applications are being contemplated.
  - Not for passengers or in-flight entertainment
Examples of Aircraft Wireless Applications – Traditional systems vs. WAIC systems

**Traditional Aircraft Wireless:**
- Unprotected spectrum
- Applications – not safety-related
- Radio regulatory activity:
  - 5 GHz/2.4 GHz RLANs on Aircraft
  - UWB on Aircraft

**WAIC Systems:**
- Protected spectrum
- Safety related applications

- TWLU
- Gatelink
- CWLU
- Maintenance Laptop
- Internet Connectivity
- Proximity Sensors
- Engine Sensors
- Landing Gear Sensors
Importance of WAIC to Aviation Industry

• Simplify and reduce life-cycle cost of airplane wiring
  – Wiring harness designs
  – Labor-intensive cable fabrication
  – Reliability and replacement costs of connectors
• Improved flight safety
  – Wireless link for redundancy
  – Reduce aging wiring and associated fire hazards conditions
• Increased Reliability
  – Fewer connector pins/failures, cracked insulation, & broken conductors
• Improve Operational Efficiency
  – Ability to obtain more data from aircraft surfaces
  – Less wire maintenance to remedy chafing conditions
  – Reduced weight should save fuel costs and result in environmental benefits.
WAIC Technical Characteristics

• WAIC is based on short range radio technology (< 100m)
• WAIC will utilize low transmission power (< 10 mW)
• Most applications are internal - within fuselage/cabin
• External transmission via directive antennas (e.g. landing gear, wings)
• Communication in WAIC systems takes place between aircraft stations (although both on same aircraft)
• Communication in WAIC systems is related to safety and regularity of flight
• Examples of potential applications:
Examples of Potential WAIC Applications

• Low Data Rate, Interior Applications:
  – **Sensors:**  Cabin Pressure - Smoke Detection - Fuel Tank/Line – Proximity Temperature - EMI Incident Detection - Structural Health Monitoring - Humidity/Corrosion Detection
  – **Controls:**  Emergency Lighting - Cabin Functions

• Low Data Rate, Outside Applications:

• High Data Rate, Interior Applications:
  – **Sensors:**  Air Data - Engine Prognostic - Flight Deck/Cabin Crew Still Imagery / Video
  – **Comm.:**  Avionics Communications Bus - FADEC Aircraft Interface - Flight Deck/Cabin Crew Audio / Video (safety-related) - Flight -Operations related Digital Data (e.g. EFOS...)

• High Data Rate, Outside Applications:
  – **Sensors:**  Structural Health Monitoring - Imaging Sensors (Still and Video)
  – **Controls:**  Active Vibration Control
  – **Comm.:**  Avionics Communications Bus
Engagement with ITU-R and Future Actions

• **Working Party 5B has been the lead ITU-R Group for WAIC**
  - In November 2010, ITU-R Study Group 5 approved a New Report (M.2197) which provides findings on the Technical Characteristics and Operational Requirements of WAIC systems.
  - Result of over 3 years of work within WP 5B
  - [http://www.itu.int/pub/R-REP-M.2197](http://www.itu.int/pub/R-REP-M.2197)
  - Concludes that current aeronautical service allocations may not be sufficient to permit the introduction of WAIC systems due to the anticipated WAIC bandwidth requirements.
WRC-12 Preparations: Agenda Item 8.2

Several Administrations are proposing a WRC-15 Agenda item calling for the ITU-R to conduct studies and take appropriate regulatory action to accommodate the spectrum requirements of WAIC:

– CITEL approved an Inter-American Proposal on WAIC in May 2011.
– APT approved a proposal from New Zealand for a WAIC Agenda Item.
– CEPT is finalizing adoption of its new WRC Agenda Item proposals.
  Germany has proposed an agenda item and draft resolution text on WAIC in November 2010. Currently there is support for the proposal from seven CEPT Administrations. A final decision on the CEPT position will be made at the last CPG meeting in early November 2011
– RCC adopted a position to support a WAIC Agenda Item.
– ATU: A presentation on WAIC was made to the African Group Preparatory Meeting for WRC-12 held in Algiers during July.
– ASMG: Briefing on WAIC was made to the ASMG meeting held in Sharm El Sheikh.
WRC-12 Preparations: 8.2
New Agenda Item on WAIC

• One common theme in all regional proposals is the need to review frequency bands currently used by the aviation industry, and then review frequency bands above the aeronautical bands.
• Because it is anticipated that WAIC systems will be classified as part of the ICAO recognized aeronautical systems, changes to the radio regulations will be necessary in order to enable WAIC systems to operate in the current aviation bands that are used for specific aeronautical systems.
• Regional proposals are available at:
  – www.citel.oas.org
  – www.aptsec.org
  – www.cept.org/ecc/groups/ecc/cpg/page/cept-briefs-and-ecps-for-wrc-12
  – www.asmg.ae
  – www.rcc.org.ru
  – www.atu-uat.org
Agenda Item 8.2: ICAO Support

ICAO supports the aviation industry’s efforts to derive the benefits of wireless technologies and expressly supports in its WRC-12 position finding additional spectrum for WAIC systems.

- Continued support from ICAO, prior to and post approval of a WAIC Agenda Item is critical.
- Critical that world-wide allocation(s) are obtained because of the global operations of commercial aircraft.
- Spectrum usage of WAIC systems must fall within ICAO Convention in order to obtain benefits for equipment certification.
Summary

• WAIC systems provide opportunities to improve flight safety and operational efficiency while reducing airline operational costs;

• Finding appropriate regulatory solutions to enable WAIC systems to operate safely with other radio services is necessary;

• Obtaining globally-harmonized, dedicated spectrum for WAIC systems is a significant challenge to the aviation industry;

**Under WRC-12 Agenda item 8.2; African region Civil Aviation Agencies are invited to support within their national WRC-12 preparation process the new Agenda Item proposals for WAIC made by the Regional organizations.**
Thank You

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Acronym list

APT: Asia-Pacific Telecommunity
ASMG: Arab Spectrum Management Group
ATU: Africa Telecommunications Union
AVSI: Aerospace Vehicle Systems Institute
CEPT: Conférence Européenne des Postes et Télécommunications
CITEL: Inter-American Telecommunication Commission
CPG: Conference Preparatory Group
CWLW: Cabin Wireless LAN Unit
EFOS: Electronic Flight Operations System
EMI: Electro Magnetic Interferences
FADEC: Full Authority Digital Engine Control
ICAO: International Civil Aviation Organization
ITU: The International Telecommunication Union
RCC: Regional Commonwealth in the field of communications
RLAN: Radio Local Area Network
TWLU: Transmitter Wireless LAN Unit
UWB: Ultra Wide Band
WAIC: Wireless Avionics Intra Communications
WRC: World Radio Conference