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AeroMACS Discussion Period

**AFC Spring 2014 Meeting
Vancouver, BC**

Scope

- To discuss AeroMACS implementation in the US spectrum
 - Considering information from the interested organizations
- Objectives
 - Identify unknowns still outstanding
 - What courses of action are now required?

Discussion Period

- WiMax forum
- Spectrum environment
- Airframe manufacturers
- Airline and cargo users
- DSPs
- FAA
- Regulatory aspects

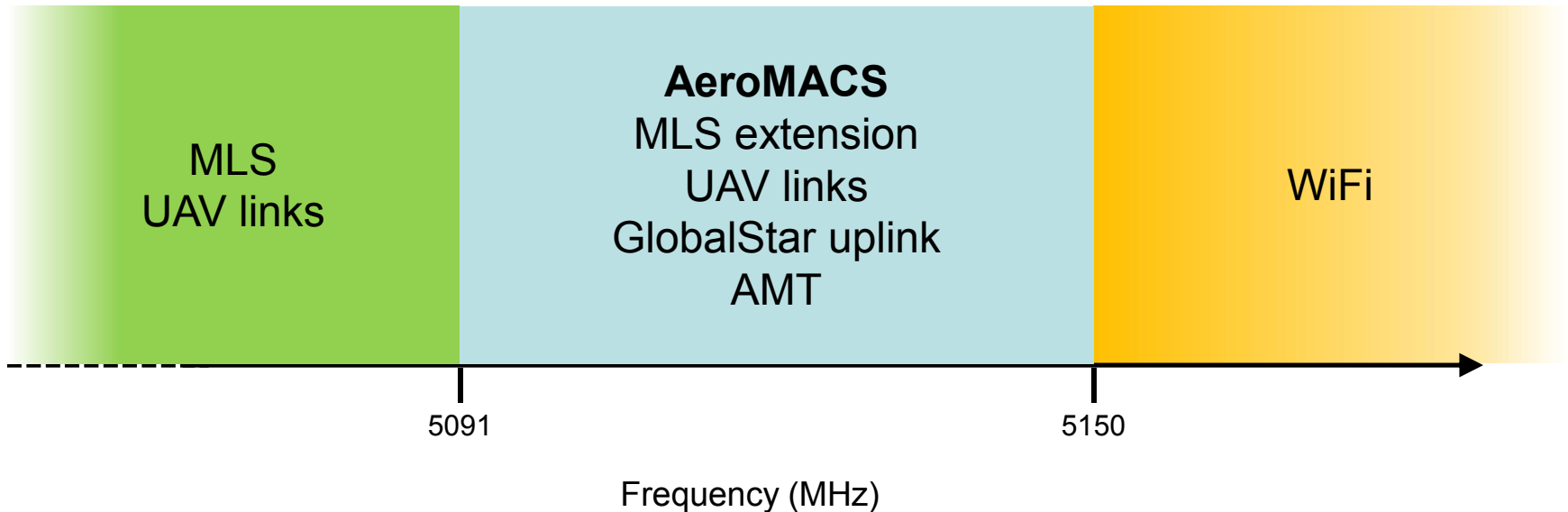
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Spectrum Environment

5000	5010	5030	5091	5150	5216	5250
		MICROWAVE LANDING SYSTEM (See 5.444)				
gional)		AERONAUTICAL RADIONAVIGATION				
			AERONAUTICAL MOBILE (including AM(R)S (See 5.444B)			
ON 3A)		RADIONAVIGATION SATELLITE (s-E)(s-s) (see 5.443B)				
		AERONAUTICAL MOBILE SATELLITE (R) (See 5.367)		FIXED- (See 5.447B) SATELLITE (s-E)		
		FIXED-SATELLITE (E-s) (See 5.444A)		FIXED-SATELLITE (E-s)		
		MOBILE ex aeronautical mobile		MOBILE ex aerona		
		RADIO ASTRONOMY				

Systems of consideration



AeroMACS

- Assigned a primary AM(R)S allocation for 5091-5150 MHz in WRC-07
 - Given the ‘unused’ MLS extension band
 - Limited to aviation surface safety applications at airports
 - AMT also given co-frequency allocation at same time
- Operational limitation
 - Limited to airport surface applications
 - Must be in accordance with international aeronautical standards
 - Must meet interference limits to co-frequency FSS

Microwave Landing System

- Co-primary and adjacent safety allocation
- Intended to replace ILS
 - Limited uptake
 - Operated in Europe (UK), USA (USAF) and China
- No intent to introduce for civilian applications in North America
 - No intention received from the FAA or NAV Canada
 - GPS/WAAS has replaced requirement
 - Airlines reluctant to install new nav equipment
- No significant coordination requirement anticipated in the US

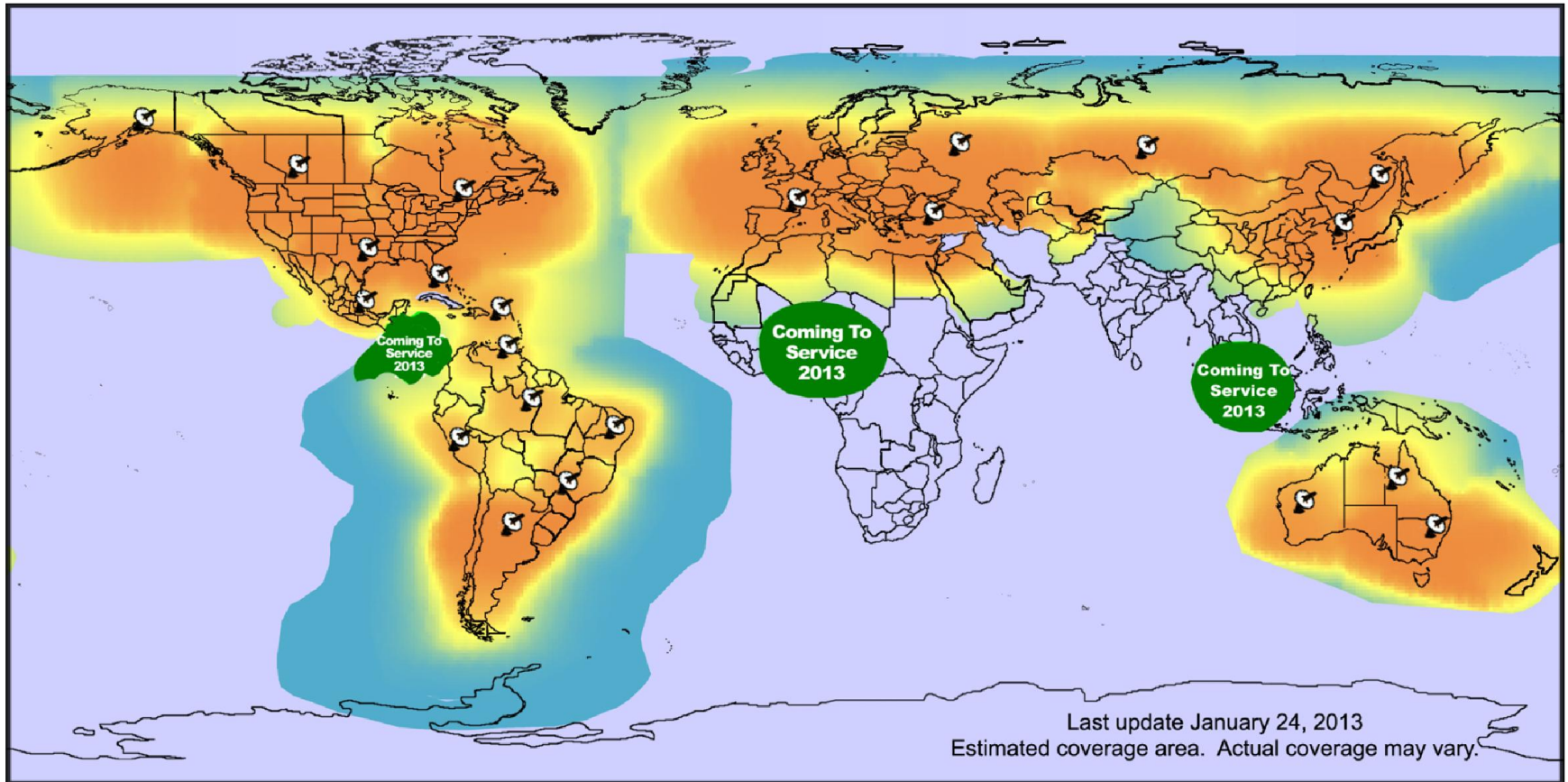
Aeronautical Mobile Telemetry

- Co-primary allocation (non-safety)
- Provides data to ground sites from test aircraft
 - One-way link from aircraft to ground receiver
 - Receiver tracks aircraft signal
- Combination of military and civilian use
 - Mostly operated in isolated areas at 52 sites across US
 - Several civilian airports have onsite/nearby operations
 - Seattle, St Louis, Dallas/Ft Worth, etc.
- Potential interference between systems
 - AMT signal into AeroMACS BSs
 - AeroMACS signal into AMT tracking receivers
- No coordination mechanisms considered at this time

GlobalStar Uplinks

- Co-primary allocation (non-safety) by footnote
- Uplink band for controlling GlobalStar network
 - Ground stations provide data to LEO satellite network for mobile satellite system
 - Locations include several sites in the US
 - Unlikely interference from AeroMACS according to studies
- ITU placed interference limit on AeroMACS signal received by satellite
 - Aggregate AeroMACS interference must not exceed 1% rise over thermal
 - New limit of 5% currently being considered in ITU-R agenda item 1.7
 - Studies show approx. 500 locations can be operational without adverse effects
- Coordination requirements
 - Calculate aggregate interference to satellites from deployments
 - Must be considered in a plane 1414km above mean sea level
 - Account for ground station locations

GlobalStar Ground Stations



UAV Control Links

- Co-primary and adjacent safety allocation
- Satellite up and downlink for CNPC communications
 - Only available aviation safety spectrum currently allocated to UAVs
- Coordination requirement unknown
 - No current plans for usage

WiFi

- Adjacent band allocation (non-safety)
- Worldwide allocation for unlicensed WiFi
 - Yet to be adopted in the US
 - Proposal currently going through the FCC
- ITU-R placed several limitations on operation
 - Limited to indoor use
 - Power limits for satellite coordination in band
- Possible coordination requirement
 - Adjacent band interaction

Coordination Summary

- Primary requirements
 - GlobalStar Uplinks
 - AMT
- Secondary requirements
 - WiFi
 - UAVs
 - MLS

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AeroMACS Regulatory Considerations

US Regulatory Implementation

- FCC considering WRC-07 implementation as a whole
 - NPRM 12-338 issued in 2012
 - AeroMACS a small element
- FCC nearing final implementation ruling
 - Will only provide a suitable allocation
 - Does not consider service rules for operation
- FAA has already implemented federal systems in the band
 - NTIA authorization informed to FCC in 2013
 - Using fixed links for distribution network (AeroMACs system with directive antennas)
- Comments from FCC would welcome industry proposal on service rules

Filing requirements

- Filing will need to cover the following aspects:
 - Description of the service proposed
 - Explanation of the need for the service
 - What will it accomplish
 - Draft technical specs for the operation
 - Criteria for sharing with other services
 - Spectrum management approach
 - Licensing approach for ground and aircraft
 - Suggests for CFR 47 Part 1 & 87 rule modifications

AFC Recommended Principles

- Provide an economic benefit to the airline and cargo users.
 - Automated and timely reporting mechanisms to ensure data is available for analysis quickly.
 - Reduce human factors element in data process to minimize errors and associated costs.
- Minimize operational complexity for implementation.
 - System should not be mandated.
 - Deployment at core air-hubs by standardized providers.
 - Ability for airline owned networks at required airports.
- Appropriate management and control mechanisms.
 - A multi-provider environment to ensure competition (service and equipment).
 - Airlines and cargo carriers will be stakeholders in the management of the AOC spectrum.
- Regulatory compliance.
 - Provide a communications method for AOC communication applications.
 - Prevent access for services which would put into doubt the integrity of the AM(R)S.

Direction forward?

- Current options for AeroMACS management being considered by the FAA is as follows:
 - FAA owned and operated, ATS only
 - FAA owned and operated, ATS and AOC
 - FAA owned and contractor operated, ATS only
 - FAA owned and contractor operated, ATS and AOC
 - Contractor owned and operated, ATS only
 - Contractor owned and operated, ATS and AOC

AFC AeroMACS Concept?

- Separate federal and airline spectrum allocations
 - Segregation of spectrum at a national level
- Single licensee to coordinate amongst multiple providers
 - Non-discriminatory licensing to all eligible users
 - Manage aggregate interference to FSS
 - Coordinate location/time with AMS users
- Transmission of AOC and AAC messages
 - Will not provide DataComm functionality

Part 87 Modifications

- §87.131 Power and emissions
- §87.133 Frequency stability
- §87.137 Types of emission
- §87.139 Emission limitations
- §87.141 Modulation requirements
- §87.171 Class of station symbols
- §87.261 Scope of service
- §87.263 Aeronautical en-route frequencies
- §87.265 Administrative communications
- §87.267 New service provision?

Outstanding Institutional Issues

- FAA operation and spectrum requirements
 - What and how are they using the spectrum?
- AMT operational requirements
 - Confirmation of interference?
 - Operating parameters and areas?
 - Coordination options?
- Intent of DSPs and airlines for network deployment
 - Capacity of spectrum for multi-provider solution?
 - Provision of service first?
- Availability of equipment
 - Avionics and ground stations into service?
- Frequency coordination requirements
 - Coordination and assignment tools/resources required?

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Questions?

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