Understanding AeroMACS  
(Airport Surface Communications)

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Outline

- Mobile WiMAX Applications
- Aviation Network Systems
- AeroMACS: NGN Airport Communications
- Development and Standardization
- Role of WMF
- Road Map
What Mobile WiMAX brings us

*Anytime, Anywhere, Anyone & Anything being connected*

- **Smart Grid**
- **Aviation**
  - AeroMACS
- **Remote Healthcare & Medicine**
- **Remote Pharmacy**
- **Remote Clinic**
- **Mobile Cloud Service**
- **Data Center**
- **ASN-GW**
- **Remote Education**
- **School**
- **Residence**
- **Plow land**
- **Fishing village**

Enhanced quality of Life

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Aviation Network System

- Air-air communications
- Satellite-based communications
- Airport (surface) communications
- Ground-based communications

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Airport Communications
Transmission patterns & Basic design scenarios

Transmission from control tower to aircrafts
< Broadcast, multicast and unicast transmissions >

Transmission from aircrafts to control tower
< Multiple access channel >
Technical issues/concerns around airports

- No capacity left to upgrade ATC (Air Traffic Control) & ATM (Air Traffic Management)
  - Voice based on DFB-AM (Double-sideband amplitude modulation)
  - Data link based on VHF digital link (VDL mode 2)
  - And old-fashioned…
- Necessity of new airport communication system to enhance management and control capability and implement new functions: robust, efficient, secure, safe & flexible
- Increased traffic congestion and accident risk
- More delays and serious impact on airline businesses, in particular LCC
- Wasting energy and green concerns

What happened with my flight to Sofia on Monday is …
Next-Gen. Airport Communication Systems

◆ Potential Mobile Applications
  - ATC*1 communicates with any aircraft (A/C*2-to-fixed, A/C-to-A/C) anywhere
  - AOC*3, Advisory, and non-ATS*4 voice/data between airlines and pilot
  - Mobile SWIM*5 and airport surface users

◆ Potential Fixed Applications
  - Sensor data collection/dissemination for situational awareness
  - Cable/Telcom replacement/augmentation

Why WiMAX for NGN Airport Comm.? 
*Through WiMAX 5Ss: high-Speed, Seamless, Services, Simple and Security*

**【 Technical values 】**
- Broadband: 20Mb/s ~ 75 Mb/s at maximum
- Broad coverage: 1 ~ 3 km range
- Data Oriented / Machine to Machine communications
- Always being connected
- Low failure rate (high availability)
- Easy and fast installation
- Free from the legacy telephony system

**【 Business values 】**
- No management cost for telephone Number.
- Low cost for installation & maintenance
- Simple mobile station ⇒ Easy airworthiness certificate
- Easy IOT due to less proprietary specifications
Airport Community with AeroMACS

Airport (Aerodrome)

AeroMACS Core

Avionics Comm Center

Wireless Backhaul

Mobile BaseStation

Fixed Services

Mobile Station

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AeroMACS so far

- Action Plan 17 (AP17) for future efficient ATM at UN/ICAO*1 ACP:
  - WiMAX(IEEE802.16e-2009) was selected at ICAO 11th Air Navigation Conference(AN-Conf/11) in 2007

- International Study & Development at ICAO, U.S., EU, Japan and …
  - ICAO ACP WG-S, JCAB*2/ENRI*3(Japan), WiMAX Forum Aviation-WG
  - EuroCONTROL/EuroCAE (EU Commission), JCAB/ENRI(Japan)
  - FAA/RTCA Special Committee 223 (US), JCAB/ENRI (Japan)
  - WiMAX Forum Aviation–WG, Technical-WG, Certification-WG

- Joint Projects at FAA/NASA and EUROCONTROL
  - FAA/RTCA: NASA, US system venders
  - EUROCONTROL/EuroCAE: France, Germany, Spain, Sweden, U.K. system venders

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*1 UN/ICAO (United Nations / International Civil Aviation Organization)
*2 JCAB (Japan Civil Aviation Bureau)
*3 ENRI(Electronic Navigation Research Institute)
Joint project with FAA and NASA

Test Bed Project at Cleveland Airport, U.S.

Source: AeroMACS for Potential Aats – SWIM TIM6 03 November 2010

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AeroMACS overview

1. Frequency & Bandwidth
   - Frequency: C-band (5095MHz - 5150MHz / 5000MHz – 5030MHz)
   - Bandwidth: 5MHzx2/CH

2. Base Station signal level control & optimization
   - Power control to minimize RF interferences (FAA Satellite RF interference simulation)
   - RF simulation and Optimization by practical field test on Airport surface

3. MIMO function support
   - Only MIMO-A support at this moment
     (MIMO-B under discussion: only one antenna system on Airborne)

4. Security function support (under discussion)
   - Supporting Layer discussion through WIMAX

5. VoIP function support (under discussion)
   - Requirement of Voice function from Avionics industries

6. MBS(Multicast and Broadcast Service) function (under discussion)
   - Innovation of Broadcasting through Multicast-technology
Collaborative Standardization Project

AeroMACS System Requirement Documents (EuroControl)

MOPS = Minimum Operational Performance Specification
MASPS = Minimum Aviation System Performance Specification
CRSL = Certification Requirement Status List
PICS = Protocol Implementation Conformance Statement
SARPS = Standards and Recommended Practices

Order to AT4W

System Profile

Creation by RTCA

Requirements Specifications
- Airborne MOPS Collaborations by EuroCAE/RTCA
- Ground MOPS by only EuroCAE
- Creation by EuroCAE Requirements for Performance
- Create by ICAO ACP Whole System specifications

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WiMAX Forum’s role

Feasible Specification & Certification Test Items

• Create the function list (PICS) to clarify certification test items for the function validation

• Create the certification test items (PCT, RCT, MIOT) in the AeroMACS-PICS by WiMAX Forum

• Guarantee (Certify) the Inter-Operability by WiMAX Forum Certification Working Group’s Certification
Activity within WiMAX Forum

CWG
Create Certification Test Items

TWG
System Profile

AWG
Point of Contacts Overall Management

Depoy to TWG about Technical Issue
Formal response as WMF (AWG)

Aviation Industries

Acceptance at TWG

Create Certification Test Items

Point of Contacts Overall Management

Deploy to TWG about Technical Issue
Formal response as WMF (AWG)

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AeroMACS Roadmap

For world-wide commercial deployment

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