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SESAR ATM KEY FEATURES

1. MOVING FROM AIRSPACE TO 4D TRAJECTORY MANAGEMENT
2. TRAFFIC SYNCHRONISATION
3. NETWORK COLLABORATIVE MANAGEMENT AND DCB
4. AIRPORT INTEGRATION AND THROUGHPUT
5. CONFLICT MANAGEMENT AND AUTOMATION

SYSTEM WIDE INFORMATION MANAGEMENT

Source: S-JU / ATM Masterplan
CNS ENABLING THE SESAR CONCEPT

• Communication technologies are **key enablers** and its evolution is fundamental to support new **SESAR concept**

• Support to **future ATS** and **AOC datalink services**

• **Current capacity saturation**

• **Safety** critical com requirements
OVERVIEW AND SCOPE OF SESAR AEROMACCS

GENERALITIES

Projects scope

- Define, validate and demonstrate a new airport surface communication system (AeroMACS) based on WiMAX 802.16 standard to support ATS/AOC communications:
  - Project 15.2.7 covers overall system aspects and ground component
  - Project 9.16 covers airborne component
- Includes the development of prototype AeroMACS MS and BS and testing in Lab, on Cars, and on Aircraft at Toulouse Airport

Partners

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Duration: March 2010 to Q1 2015
OVERVIEW AND SCOPE OF SESAR AEROMACS

MAIN ACTIVITIES

• Common studies on the overall AeroMACS System
  • AeroMACS system functional and performance definition
  • Definition of a new IEEE 802.16-2009 (AeroMACS) profile
  • Simulations and performance analysis
  • Security and safety analysis

• Coordination with standardization bodies (RTCA/EUROCAE/ICAO)

• Specification and development of MS and BS prototypes

• V&V activities
  • Development of V&V plans, test benches, test objectives and procedures
  • Test in laboratory environments, including interoperability (multiple manufacturers)
  • Tests in real airport environment – first static, then on Cars, and later on Aircraft, at Toulouse Airport
OVERVIEW AND SCOPE OF SESAR AEROMACS

WORKING ACTIVITIES

**P.15.02.07**
Airport Surface Datalink

- **T01**
  Overall IEEE 802.16e/aero System Analysis & Design (Lead EUROCONTROL)
- **T02**
  Channel models and propagation analysis (Lead NATMIG)
- **T03**
  IEEE 802.16e/aero profile (Lead EUROCONTROL)
- **T04**
  Development & Integration Analysis (Lead AENA)
- **T05**
  System Implementation (Lead SELEX ES)
- **T06, T10, T11, T12**
  Integration and Testing (Lead THALES)
- **T07**
  Standardization and Global Interoperability (Lead EUROCONTROL)
- **T08**
  Security and Safety Analysis (Lead DSNA)

**P.9.16**
New Communication Technology at Airport

- **T01, T02, T03**
  Deployment and Integration Analysis (Lead SELEX/AIRBUS)
- **T04, T05, T17**
  Airborne Prototype development (Lead SELEX/AIRBUS)
- **T06, T07, T08, T09, T10, T11, T18, T19**
  Integration and Testing development (Lead AIRBUS)
OVERVIEW AND SCOPE OF SESAR AEROMACS

SIMPLIFIED SCHEDULE

- Common Studies and Specification of the AeroMACS Prototypes
- Coordination with standardization bodies (RTCA/EUROCAE/ICAO/WiMAX Forum/AEEC)
- Development of the BS and MS prototypes
- Tests Preparation/Definition
- Tests and Reports
OVERVIEW AND SCOPE OF SESAR AEROMACS

ACHIEVEMENTS (1/2)

✓ Ongoing active coordination with US/FAA
✓ **Support to standardisation** bodies for AeroMACS: EUROCAE WG-82, RTCA SC-223, ICAO WG-S, WiMAX Forum (AWG) and AEEC/SAI
✓ SESAR 9.16/15.2.7 Projects have **contributed** to the joint (EUROCAE and RTCA) development of the **AeroMACS profile** based on mobile WiMAX standard and the **AeroMACS MOPS**
✓ SESAR 9.16/15.2.7 Projects are **supporting** the development in EUROCAE of the **AeroMACS MASPS**
✓ SESAR 9.16/15.2.7 Projects are **contributing** to the development of the **AeroMACS SARPs and Technical Manual** in ICAO
✓ SESAR 9.16/15.2.7 Projects have **supported** the development in WiMAX Forum of specific **AeroMACS docs** (PICS, CSRL, …)
✓ SESAR 9.16/15.2.7 Projects will **provide input** to the AEEC/SAI for the **AeroMACS Avionics Standard**
ACHIEVEMENTS (2/2)

- Extensive simulations have been carried out to validate the AeroMACS profile
- AeroMACS system definition documents delivered, including Architectures Description, Systems Specification, and Systems Verification
- AeroMACS testbed platforms developed to support laboratory and airport tests
- Prototype development and laboratory tests are completed
- Prototypes are deployed on Toulouse airport, ready to support Toulouse airport tests: car tests and aircraft tests
- P.15.02.07 Toulouse airport car tests completed
- P9.16 AeroMACS installation on A320 test aircraft
- Contribution to SARPS validation
AEROMACS VERIFICATION PROCESS

PRE-VERIFICATION:
Test plans, simulations, site survey

LAB TESTS:
MS/BS Interoperability, Link Adaptation, Profile compliance, RF performances, Network security ...

AIRPORT DEPLOYMENT:
Base Stations, Mobile stations (fixed MS, service vehicle, aircraft)

AIRPORT TESTS:
Link adaptation, modulation performance, cell coverage, NLOS performance, multi-channel usage, mobility, handover ...
AEROMACS INFRASTRUCTURE

Mobile Systems + Ground Base Stations + Access Service Network
EASA data link report – REC for further investigations:

"VDL2 was not designed for large data exchanges. Therefore, it is essential to expedite the fielding of specific technology for the airport surface (e.g., AeroMACS). In parallel, it is important to explore the use, for en route, of alternative technologies such as satellite-based communication (e.g., ESA project ANTARES or its precursor THAUMAS) and/or new technologies such as L-band Digital Aeronautical Communication System (LDACS)."
OUTCOME OF SESAR AEROMACS PROJECTS

- Development of AeroMACS prototypes
- Deployment at real airport environment for preoperational trials and ready for deployment consideration
- Contribution to standardization: ICAO, EUROCAE, RTCA, WMF, AEEC
- SESAR contribution to SARPS validation
- Included in ICAO Technology Roadmap (Blocks)
- AeroMACS is the first of the new datalink components
NEXT STEPS

• Finalization of SESAR AeroMACS project activities by Q1/2015

• Further standardization activities will continue: AEEC, ICAO

• AeroMACS potential ‘SESAR Solution’ candidate

• Discussions for future activities (SESAR2020, PCPs)

• Demonstration activities under consideration
Thank you for your attention

Nikos Fistas
SWP15.2
AeroMACS Standardisation

Stephane Tamalet
P9.16 Project Manager

Hyung Woo Kim
P15.02.07 Project Manager