



P9.16 Final Project Report

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Abstract

This deliverable is the P9.16 Final Project Report.

The project aimed at defining, validating and demonstrating a technical profile and architecture for a new generation of airport surface data link system, in coordination with P15.02.07.

Overall the project P9.16 together with project P15.02.07 focused on the Aeronautical Mobile Airport Communication System (AeroMACS) which is the new generation airport surface data link and supported the standardization of AeroMACS in various groups such as ICAO, EUROCAE, RTCA, AEEC and WiMAX Forum.

Project P9.16 partners focused particularly on the Airborne component of the AeroMACS system and undertook the study, definition, development, aircraft integration and testing of an Airborne prototype as well as supported the global harmonization and coordination to define and verify the AeroMACS specifications.

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Intellectual Property Rights (foreground)

This deliverable consists of SJU foreground.

Publishable summary

As envisaged in the European ATM Master Plan, new A/G datalink technologies will be used as part of Future Communications Infrastructure (FCI).

AeroMACS (Aeronautical Mobile Airport Communications System) is one of the three new A/G datalinks components considered in the Future Communications Infrastructure (FCI). It is a new airport communication system foreseen for future airport surface communications.

SESAR projects P15.02.07 and P9.16, in strong collaboration, supported the definition and verification of a technical profile and architecture for the AeroMACS system with the definition, development, integration and testing of prototype equipment. The two projects supported the standardization of AeroMACS in various groups such as ICAO, EUROCAE, RTCA, AEEC and WiMAX Forum. The project partners performed analysis, simulations, prototype developments and coordinated globally with interested partners to define and verify the AeroMACS specifications.

Based on the commercially used telecom technology WiMAX and the 802.16 IEEE standard, AeroMACS is the outcome of extensive investigations in aviation starting from 2004 onwards and involving Europe, US as well as Japan. In this context, participation and contribution from SESAR P9.16 and P15.02.07 has been crucial in the development of the AeroMACS system.

AeroMACS provides an IP-based broadband mobile datalink that is foreseen to support both safety of life and regularity of flight operations, capable to support services demanding high performance, stringent QoS, Security, Broadcast, Multicast and Mobility capabilities. AeroMACS can support mobile services (airport service vehicles and aircrafts) as well as fixed services:

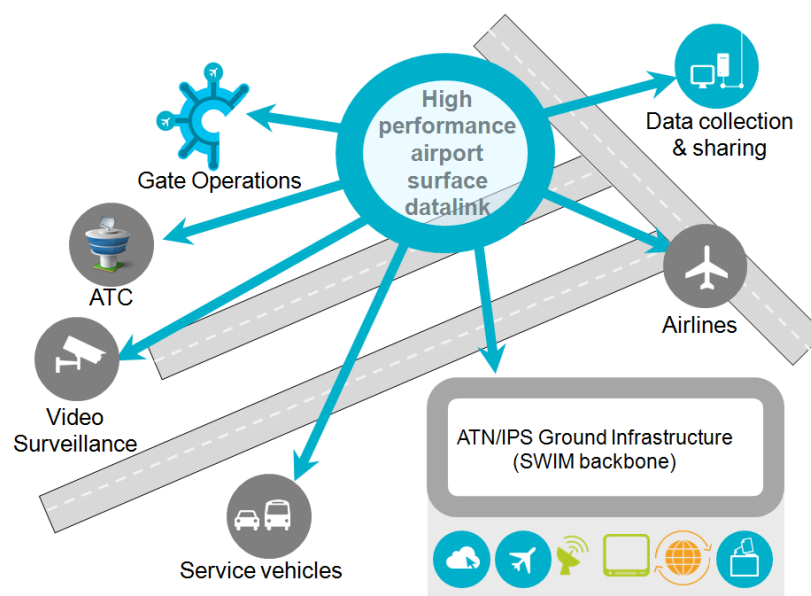


Figure 1: Potential uses of AeroMACS

Whereas the SESAR P15.02.07 and P9.16 shared the same overall objective, the structures of these projects have been defined as follows:

1. P15.02.07 was organized to be the hosting project for top level global and transverse activities and deliverables on the AeroMACS system, for which P9.16 did however contribute through efforts in the consideration of aircraft related specificities and constraints.
2. P15.02.07 also encompassed all activities that were specific to the ground component of the AeroMACS System.
3. P9.16 contributed to the above common overall objective, focusing on the airborne component of the AeroMACS System.

The P9.16 was structured in four Working Areas, and 14 Tasks as depicted in Figure 2:

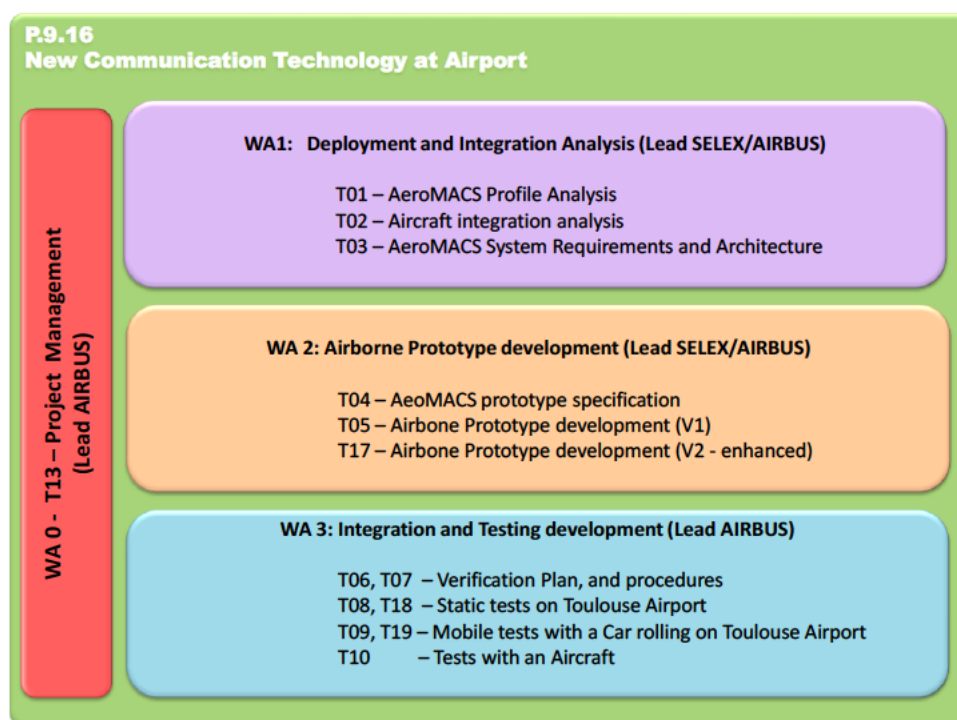


Figure 2: P9.16 Working Activities

Main results and outcomes:

SESAR P9.16 has achieved the following specific objectives:

- ✓ Analysis of impacts of the installation of an AeroMACS system on an Aircraft
- ✓ Identification of alternative AeroMACS Airborne System architectures, and production of an Airborne AeroMACS System Requirements and Architecture document.
- ✓ Specification and development of an AeroMACS Mobile System prototype.
- ✓ Verification activities:
 - ✓ Development of Verification plans, test benches, test objectives, procedures and reports.
 - ✓ Testing in closed laboratory environments.
 - ✓ Tests in real airport environment – first with the Mobile System located at a static position (in Airbus Laboratory), then on cars moved on the Airport surface and finally on an Aircraft at Toulouse Airport.
- ✓ In collaboration with P15.02.07:
 - ✓ Contribution to the AeroMACS system functional and performance definition.
 - ✓ Contribution to the New IEEE 802.16-2009 (AeroMACS) profile definition.
 - ✓ Coordination with standardization bodies (RTCA / EUROCAE / ICAO / WIMAX FORUM, ARINC AEEC).

During the project life, the following coordination took place with other SESAR projects and external working groups:

- ✓ P9.16 has achieved close coordination with SESAR P15.02.07, sharing overall objectives.

- ✓ P9.16 has conducted coordination with SANDRA project, including coordination in the Verification Objectives and sharing of simulation tools or test infrastructures at airport environment.
- ✓ In collaboration with P15.02.07, P9.16 has contributed to coordination that took place with :
 - 3rd Party Resources.
 - Several standardization groups:
 - EUROCAE / RTCA
 - ICAO ACP
 - WiMAX Forum
 - ARINC AEEC
-
- The collaboration with P15.02.07, and the coordination with the standardization groups have contributed to the production of the following standards by the standardization groups:
 - AeroMACS SARPs
 - ED-222 Aeronautical Mobile Airport Communication System (AeroMACS) Profile
 - ED-223 Minimum Operational Performance Standards (MOPS) for the Aeronautical Mobile Airport Communication System
 - ED-227 Minimum Aviation System Performance Standards (MASPS) for the Aeronautical Mobile Airport Communication System
 - WiMAX Forum® AeroMACS Protocol Implementation Conformance Statement (PICS) Proforma (WiMAX Forum)
 - WiMAX Forum® AeroMACS Certification Requirement Status List (CRSL) (WiMAX Forum)

From the tests conducted during the test campaigns, it can be concluded that AeroMACS performances can be suitable from a technical perspective to support mobile and fixed services as future datalink at airport surface.

Conclusion:

The main outcome of SESAR 9.16 can be summarized below:

- Support to the International standardization of AeroMACS
- AeroMACS Airborne system requirements and architecture elements are available to serve as a baseline for a future certified AeroMACS system development.
- Preferred location for the AeroMACS Antenna on Airbus Aircraft has been determined
- Development of an AeroMACS Mobile System prototype
- AeroMACS deployment at a real airport environment
- Qualification and installation of a representative AeroMACS system on aircraft
- Verification exercises successfully conducted at manufacturer labs in closed environment
- Verification exercises partly successful in a deployed environment at Toulouse airport, with tests done with the AeroMACS Mobile System prototype installed successively, at the Airbus laboratory, on a car moved on the Toulouse Airport surface, and on an Airbus test Aircraft.
- No issues of Aircraft co-site interferences in between AeroMACS and other Aircraft systems have been observed.
- Cases of interferences in between AeroMACS and Airbus AMT appear to be manageable, because in-flight AMT-equipped Aircraft do not interfere with AeroMACS communications at Airport. Interference issues may be encountered only on few French Airports where AMT-equipped Aircraft can land .

The verification activities also identified few technical aspects that need to be further investigated and refined and they include further system integration testing and further work in the frame of standardization (e.g. AeroMACS Certification, PKI& Security, standard Airborne AeroMACS equipment architecture).

The project conclusions also comprise recommendations for possible future SESAR project on AeroMACS, and highlight the need to progress on the establishment of the AeroMACS business case and ground infrastructure implementation strategies and plans

The SESAR P9.16 project team is composed by AIRBUS, EUROCONTROL, SELEX ES and THALES.

Acronyms

Term	Definition
A/G	Air/Ground
AEEC	Airlines Electronic Engineering Committee
AeroMACS	Aeronautical Mobile Airport Communications System
ANSP	Air Navigation Service Provider
APIM	AEEC Project Initiation/Modification
ATC	Air Traffic Control
ATM	Air Traffic Management
ATS	Air Traffic Services
AWG	Aviation Working Group
CRSL	Certification Requirement Status List
E-OCVM	European Operational Concept Validation Methodology
EUROCAE	European Organization for Civil Aviation Equipment
ICAO	International Civil Aviation Organization
IP	Internet Protocol
FAA	Federal Aviation Administration
FCI	Future Communications Infrastructure
FFF	Form Fit and Function
IATA	International Air Transport Association
ITU	International Telecommunication Union
MASPS	Minimum Aviation System Performance Specification
MOPS	Minimum Operational Performance Standards
PICS	Protocol implementation conformance statement
QoS	Quality of Service
RTCA	Radio Technical Commission for Aeronautics
SARPS	Standards and Recommended Practices
SAI	Systems Architecture and Interfaces
SESAR	Single European Sky ATM Research Programme

Term	Definition
SJU	SESAR Joint Undertaking
VLD	Very Large Scale Demonstrations
WiMAX	Worldwide Interoperability for Microwave Access

1 Final Project Report

1.1 Project progress and contribution

The activities addressed by P9.16 contributed to the following system Enablers as captured in the ATM MasterPlan¹:

EN Code	EN Title	P15.02.07 activities /contributions	Maturity ² before project	Maturity ² after project
CTE- C02d	New Airport Datalink technology - AEROMACS	<i>“New wireless technology for the Airport Datalink, based on IEEE 802.16, as a new standard for airport surface communications (ATS, AOC and APOC) for the Aircraft and Vehicles.”</i>	V2/TRL2	V2/V3(TR L5)

Table 1: List of enablers and project contribution

The standardization, simulations, prototypes development and intensive verification activities performed in P15.2.7 and P9.16 allowed to demonstrate that AeroMACS is able to support the different services it is designed for: fixed and mobile airport ground communications, Airline Operational Communications (AOC) and Air Traffic Control (ATC). Trials conducted on airport surface even show that with an appropriate coverage of the surface by Base Stations, it can support bandwidth demanding services in mobility such as video or VoIP, opening the way for multiple airport new efficient applications.

Regarding the P9.16 results alone, the laboratory tests executed in closed environment in Selex laboratory and in a deployed environment from Airbus laboratory across the Toulouse airport surface, have demonstrated the AeroMACS capacities and performances in accordance with the AeroMACS Profile and validated the majority of AeroMACS features. Limitations on the AeroMACS system/network have prevented the validation of a few points, namely the observation of 16QAM $\frac{3}{4}$ and 64QAM modulations and relative traffic throughput together with the possibility to do Security and Handover testing with DL/UL data transfer between the end systems. Difficulties have been encountered with tests done when moving at the Aircraft surface with a car, as it was observed that AeroMACS connectivity between the MS and BS could be established only at and between some points on the Airport surface. These difficulties were confirmed during the Aircraft tests, which resulted in aborting the Aircraft test session. However, the cause of these difficulties is attributed to the poor coverage of the airport surface by the Base Stations and to installation issues, and not to particular deficiencies of the AeroMACS technology. And P9.16 car tests still allowed to demonstrate, in areas appropriately covered by the Base Stations, that the Mobile System is able to register both motionless and in movement (at 40Km/h) and to support data exchanges with very good performances in line with the expectations.

Taking into account the combination of the P15.2.7 and P916 project results, the project considers that the AeroMACS technology has reached a very mature stage of TRL5 level. For OCVM, the correspondent maturity level is placed between V2 and V3, closer to V3.

¹ Data Set 13 (October 2014) is the latest frozen, publicly available at the time of writing this report

² The E-OCVM cycle is applicable to the validation of operational concepts and the assessment of its maturity. However, the E-OCVM cycle can be extended to technology verification activities, by making some analogy with Technological Readiness Level. The last two columns of Table 1 provide an indicative estimation of the project contributions towards the maturity of enablers considered in the project, supported by performance evidences provided in the P.15.02.07 and P.09.16 projects deliverables.

1.2 Project achievements

A summary of the project achievements is presented below:

- ✓ SESAR P9.16/P15.02.07 Projects have supported coordination with US/FAA
- ✓ SESAR P9.16/P15.02.07 Projects have supported AeroMACS standardisation bodies: EUROCAE WG-82, RTCA SC-223, ICAO WG-S, WiMAX Forum (AWG) and AEEC/SAI
- ✓ SESAR P9.16/P15.02.07 Projects have contributed to the joint (EUROCAE and RTCA) development of the AeroMACS MOPS and the AeroMACS profile based on IEEE 802.16 standard
- ✓ SESAR P9.16/P15.02.07 Projects have supported the development in EUROCAE of the AeroMACS MASPS
- ✓ SESAR P9.16/P15.02.07 Projects have contributed to the development of the AeroMACS SARPs and Technical Manual in ICAO
- ✓ SESAR P9.16/P15.02.07 Projects have supported the development in WiMAX Forum of specific AeroMACS docs (PICS, CSRL)
- ✓ SESAR P9.16/P15.02.07 Projects have provided input to the AEEC/SAI for the AeroMACS Avionics Standard
- ✓ AeroMACS system definition documents have been produced, including Architectures Description, Systems Specification, and Systems Verification
- ✓ Installation of an AeroMACS system on Aircraft has been studied, including determination of the preferred location of the AeroMACS Antenna on the Aircraft fuselage
- ✓ Integration of the AeroMACS system within the Aircraft systems architecture has been studied
- ✓ AeroMACS testbed platforms have been developed to support laboratory and airport tests
- ✓ Prototype development and laboratory tests have been completed
- ✓ Prototypes have been deployed on Toulouse airport supporting Toulouse airport static, car, and aircraft tests
- ✓ An airborne Mobile System prototype has been qualified for installation and use on Aircraft P9.16/P15.02.07 projects were very active in the dissemination of project results to external groups. Presentations can be found at [14].

1.3 Project deliverables

A summary of the project deliverables is presented in the table below:

Del. code	Del. Name	Description	Results and conclusions	Assessment Decision
D01	Proposed technologies and functional scope for the Airborne Aeromax prototype	IEEE 802.16e/aero system & certification profile analysis from an avionics/airborne implementation perspective. Initial design proposal for future Avionics AeroMACS products and for the 9.16 AeroMACS MS prototype.	D01 was an input to the definition of the AeroMACS profile (ED-222). And the initial design considerations were inputs for the production of D02, D03 and D04	No reservation (P)
D02	Aeromax System/Equipment Installation and Wiring Requirements Dossier	This dossier includes the specification of what would be the selected placement of the components (Antenna, transceiver) of a certified AeroMACS System on an Airbus Aircraft, the installation requirements, and wiring diagrams and directives	Determination of the preferred location of the AeroMACS Antenna on Aircraft, and of the principles for the installation and wiring of AeroMACS on Aircraft	No reservation (P)
D03	Aero Wimax Airborne System Requirements and Architecture Dossier	This document specifies the requirements to be met by an Aeromacs Airborne system, and presents the design of one possible AeroMACS Airborne system architecture	D03 requirements were inputs for the production of D04 and will be the baseline for a future Airbus AeroMACS System Requirements Document (SRD) D03 architecture was an input to generate a paper on AeroMACS Airborne architecture option used for MASPS (ED227) and for discussion at AEEC. It will also be the baseline for a future Airbus AeroMACS	No reservation

			System Design Document (SDD)	
D04	Airborne Aeromax Prototype Specification	Airbus requirements on the AeroMACS Mobile System prototype	Requirements to be met by the AeroMACS prototype	No reservation
D05	SELEX Airborne Aeromax Prototype delivery note	This document, delivered together with the AeroMACS MS Prototype, contains configuration information, a summary report on the verification done by Selex ES, information on the limitations and open problems, and a User Manual explaining how to install and operate the AeroMACS MS prototype.	Availability of the AeroMACS MS prototype	No reservation (P)
D06	Airborne Aero Wimax test strategy, objectives, and test beds architecture	This document defines the Verification strategy, the Verification Objectives, and the architecture of the verification platforms deployed on Toulouse Airport.	Verification strategy and plan Verification Objectives and their allocation to projects/partners Test beds architecture	No reservation (P)
D07	Airborne Aero Wimax test procedures document	This document, includes the test procedures for all P9.16 tests planned to be played on the Toulouse Airport, including the laboratory tests, the car tests and Aircraft tests.	Verification procedures	No reservation (P)
D11	Aero Wimax System Final Validation Report	Verification report. It describes the results of P9.16 verification exercises	An interim version of D11 was incorporated in a ICAO ACP WG-S Working Paper and used to support the Validation and approval of the AeroMACS SARPS. Main conclusions are given in section 1.5 below	Minor reservation on Issue 00.01.00 being processed

Table 2 - List of Project Deliverables

1.4 Contribution to standardization

With regard to standardization, P9.16/P15.02.07 have been closely related to AeroMACS standardization activities, providing inputs and active support to different groups. The table below summarizes the different contributions to standardization bodies:

Standardization body	Standard	Key achievements, outcome and future work
ICAO ACP / CP ICAO ACP / CP WG-S	AeroMACS SARPS AeroMACS Technical Manual	<ul style="list-style-type: none"> Projects were active contributor to the development of AeroMACS documents Active support and representation of the European side at ICAO WG-S meetings Key milestone was the contribution to the SARPS Validation that ended with the SARPS approval in December 2015. <p>Future work includes development of the AeroMACS Technical Manual</p>
EUROCAE WG-82 RTCA SC-223	AeroMACS Profile AeroMACS MOPS	<ul style="list-style-type: none"> Active support and representation of the European side at EUROCAE/RTCA meetings Key milestones achieved were the development of: <ul style="list-style-type: none"> ED-222 Aeronautical Mobile Airport Communication System (AeroMACS) Profile ED-223 Minimum Operational Performance Standards (MOPS) for the Aeronautical Mobile Airport Communication System

		Future work includes revision of AeroMACS MOPS and Profile
EUROCAE WG-82	AeroMACS MASPS	<ul style="list-style-type: none"> Active contribution in EUROCAE WG-82 <p>Key milestone was the development of the Minimum Aviation System Performance Standards (MASPS) for the Aeronautical Mobile Airport Communication System</p>
WiMAX Forum AWG (Aviation Working Group)	PICS CRSL	<ul style="list-style-type: none"> Representation of the European side at Wimax Forum, including active support in AeroMACS related events and dissemination of results into the WiMAX community [14] Support to AWG group discussions PICS and CRSL documents were developed with support of SESAR AeroMACS projects Future work includes further support to AWG: <ul style="list-style-type: none"> AeroMACS Certification Network Reference Model AeroMACS PKI
ARINC AEEC SAI	AeroMACS Avionics Form Fit and Function (FFF)	<ul style="list-style-type: none"> Submission of the AeroMACS APIM and launch of the AEEC SAI AeroMACS subgroup in 2014. Active participation in SAI meetings and dissemination of AeroMACS results [14] <p>Future work includes the development of a Form Fit and Function (FFF) standard for the AeroMACS Avionics Mobile System</p>

Table 3 – Contribution to Standardization

1.5 Project Conclusions and Recommendations

Main outcome of SESAR P9.16 can be summarized below:

- Support to International standardization of AeroMACS
- AeroMACS Airborne system requirements and architecture elements are available to serve as a baseline for a future certified AeroMACS system development.
- Preferred location for the AeroMACS Antenna on Airbus Aircraft has been determined
- Development of AeroMACS prototypes
- AeroMACS trial deployment in real airport environment
- Qualification and installation of a representative AeroMACS system on aircraft
- Verification exercises successfully conducted at manufacturer labs in closed environment
- Verification exercises partly successful in a deployed environment at Toulouse airport, with tests done with the AeroMACS Mobile System prototype installed successively, at the Airbus laboratory, on a car moved on the Toulouse Airport surface, and on an Airbus test Aircraft.
- No issues of Aircraft co-site interferences in between AeroMACS and other Aircraft systems have been observed.

- Cases of interferences in between AeroMACS and Airbus AMT appear to be manageable: in-flight AMT-equipped Aircraft would not interfere with AeroMACS communications at Airport. Interference issues may be encountered on few French Airports where AMT-equipped Aircraft can land .

Regarding standardization, the extensive inputs and contribution to international standardization activities of P15.02.07/P9.16 has to be highlighted. These included contribution to the following outstanding documents:

- AeroMACS SARPs (ICAO ACP WG-S)
- AeroMACS Technical Manual (ICAO ACP WG-S)³
- ED-222 Aeronautical Mobile Airport Communication System (AeroMACS) Profile (EUROCAE WG-82/RTCA SC-223)
- ED-223 Minimum Operational Performance Standards (MOPS) for the Aeronautical Mobile Airport Communication System (EUROCAE WG-82/RTCA SC-223)
- Minimum Aviation System Performance Standards (MASPS) for the Aeronautical Mobile Airport Communication System (EUROCAE WG-82)
- WiMAX Forum® AeroMACS Protocol Implementation Conformance Statement (PICS) Proforma (WiMAX Forum)
- WiMAX Forum® AeroMACS Certification Requirement Status List (CRSL)” (WiMAX Forum)
- AeroMACS Avionics Standard (ARINC AEEC)

Further work on standardization activities is expected during 2015.

Another key milestone to be highlighted is the AeroMACS verification. P9.16 testing activities covered a set of Verification Objectives described in the Verification Plan, including both laboratory tests and airport tests at Toulouse Airport. P9.16 testing activities also contributed to the ICAO SARPS validation. In general terms, the analysis of the extensive number of tests executed during the P9.16 test campaign shows positive results and outcome, demonstrating the suitability of AeroMACS as a good candidate technology to cover the airport surface domain for its proven performance and maturity.

The AeroMACS verification campaign has enabled the project to reach a number of conclusions and recommendations:

- In terms of performance, it can be concluded from the extensive number of tests performed within P9.16 and P15.2.7 that AeroMACS is suitable from the technical perspective to provide support to current and future operational services at airport surface.
- Difficulties have been encountered during the P9.16 field tests on Toulouse Airport, which were mainly related to the poor RF coverage of the airport, and the quality of the installations. From the analysis of the probable causes of Base Stations coverage issues, P9.16 has concluded that three principal preliminary activities are recommended for any future trials/deployments to be executed on an Airport:
 - Perform Survey and Coverage Prediction Analysis: prediction analysis is the most important activity before deploying a radio mobile network, particularly in the 5 GHz band.
 - Perform Coverage Assessment and Optimization using a closed-loop process consisting in performing prediction, assessing them, tuning the model, predicting again until reaching a high confidence on results.
 - Use proper antennas and antennas installation: coverage prediction can also provide accurate indications on type and characteristics of antennas to be used and installation options (azimuth, down tilt and pattern overlap).
- The verification activities also identified some aspects that need to be further investigated and refined; they include further testing notably: security, handover, mobility and performance for connection establishment/network entry.

³ Work in progress, expected end of 2015

When considering the whole set of activities and results of P9.16 and 15.2.7, it is considered that future activities on AeroMACS should pay a particular attention to the following points:

- Interoperability: it is highly recommended that future AeroMACS prototypes/products be invited to play the full game of the AWG Wimax Forum certification, in order to check 1) that the certification process is manageable/efficient/reasonable and 2) to confirm that going through this process truly contributes to allow that products from different vendors are fully AeroMACS interoperable
- Quality of the deployment at the Airport, fully representative of a real deployment: it is highly recommended that for any future projects, the deployment of the Base Stations at the target Airport be accomplished following state of the art practices for the deployment of a cellular network, with notable effort brought on the Airport AeroMACS network design, with RF propagation characterization, and proper calibration of propagation parameters. This should require a deep involvement of the welcoming Airport Authority to provide necessary inputs for the RF characterization studies and for the selection of optimum location for the BS antenna location.
- Larger scale, and more representative deployment at one airport, involving a higher number of Base Stations and Mobile Stations
- Quality of the installations: moving from local indoor prototype verification toward a real open RF environment require to pay a particular attention on the quality of the components (notably the wires, the antennas, the electronic equipment that may be faced to variable environmental conditions). The components shall be selected to sustain the changing environmental condition (rain, snow, wind, cold, warmth) for the full duration of the exercise, the manipulations by operators on the field (installation/desinstallation on cars, shipment of the product through international delivery services, etc..), and the condition of the verification exercises (e.g. vibrations)
- Under the perspective to reach saturation of VDL and the emerging of new services demanding high performance, it is recommended to consider AeroMACS business case and ground infrastructure implementation plans to boost the future deployment of AeroMACS. This is also supported by the EASA report on VDL and the recommendation on airport surface to expedite the fielding of specific technology for the airport surface (e.g., AeroMACS).
Future European projects on AeroMACS should include studies on the strategies that could be developed in Europe to encourage the deployment of AeroMACS, and to break the chicken and egg situation that may otherwise temper the dynamic of the AeroMACS deployment. There might be two main axis of considerations for these studies: 1) identifying the applications/services that could get an immediate benefits from the use of AeroMACS and focus the first deployment of AeroMACS for these applications/services, hoping that other services will later join the group of AeroMACS users once an initial AeroMACS infrastructure has been deployed. 2) identification of incentives that could allow current users of VDL Mode 2/ Public Cellular solutions at Airports to become interested by AeroMACS.
- The previous point is also in connection with the need to clarify the business cases for the different actors, and for that to study the costs of ownership, of operation and of the services for the different ownership and business model scenarios that could be identified, and the use cases
- From the determination of solid business and use cases, should be derived the target Airborne AeroMACS system architecture and determined how (and if) the Airport AeroMACS access network will be integrated within the today (ACARS, ATN/OSI, "public" IP internetwork) and/or future (FCI) overall aeronautical communication infrastructures.
- Further work in the frame of standardization should be envisaged on AeroMACS Certification, PKI & Security and standard Airborne AeroMACS equipment architecture.
- Hence, it is recommended to continue activities on AeroMACS in future projects (SESAR2020, VLDs)

2 References

- [1] [SESAR Programme Management Plan, Edition 03.00.01](#)
- [2] [European ATM Master Plan, Edition 2](#)
- [3] Multilateral Framework Agreement (“MFA”) signed between the SJU, EUROCONTROL and its 15 selected members on August 11, 2009, amended on 14 June 2010, 19 October 2010 and 2 July 2012
- [4] Latest Project baseline (Edition date: 16/04/2014)
- [5] P9.16-D01_v00.01.00 Proposed technologies and functional scope for the Airborne AeroMACS prototype
- [6] P9.16-D02_v00.01.00 AeroMACS System/Equipment Installation and Wiring Requirements Dossier
- [7] P9.16-D03_v00.01.00 AeroMACS Airborne System Requirements and Architecture Dossier
- [8] P9.16-D04_v00.01.00 Airborne AeroMACS Prototype Specification
- [9] P9.16-D05_v00.01.00 SELEX Airborne AeroMACS Prototype delivery note
- [10] P9.16-D17_v00.01.00 SELEX Airborne AeroMACS Prototype delivery note
- [11] P9.16-D06_v00.01.01 Airborne AeroMACS test strategy, objectives, and test beds architecture
- [12] P9.16-D07_v00.01.00 Airborne AeroMACS test procedures document
- [13] P9.16-D11_v00.01.00 AeroMACS Final Validation Report
- [14] https://extranet.sesarju.eu/WP_15/Project_15.02.07/Project%20Plan/dissemination/Presentations%20for%20dissemination%20and%20coordination%20with%20external%20groups

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