

AEEC Project Initiation/Modification (APIM)

1.0 Name of Proposed Project APIM 11-013A

AeroMACS Avionics Specification

1.1 Name of Originator and/or Organization

Nikos Fistas / EUROCONTROL

Brent Phillips / FAA

2.0 Subcommittee Assignment and Project Support

2.1 Suggested AEEC Group and Chairman

It is proposed that the work within the AEEC will be undertaken in two steps. The first step (step 1) will be within the SAI Subcommittee. The primary objective is to undertake a preliminary analysis, in particular, the desired airborne architecture meeting in an evolving manner the airline needs. A key outcome of step 1 will be the agreement on the way ahead for the AeroMACS avionics standard and will be essential to scope the standardization activity (to be carried in step 2) and identify the desired features in the ARINC Standard for AeroMACS.

Then, in step 2. use the foundation of step 1 to undertake the drafting of the AeroMACS specification in a dedicated group to be identified per the recommendation of the SAI Subcommittee.

2.2 Support for the activity (as verified)

Airlines: American, FedEx, Southwest, TAP Portugal, United, UPS

Airframe Manufacturers: Airbus, Boeing

Suppliers: ACSS, Harris, Honeywell, Rockwell Collins, SELEX ES, Thales

Others: ASRI, EUROCONTROL, FAA, SITA (all TBC)

2.3 Commitment for Drafting and Meeting Participation (as verified)

Airlines: United, UPS (others TBD)

Airframe Manufacturers: Airbus, Boeing [TBC]

Suppliers: Harris, Honeywell, Rockwell Collins, SELEX ES, Thales

Others: EUROCONTROL, FAA, SITA (all TBC)

2.4 Recommended Coordination with other groups

EUROCAE WG-82, RTCA SC-223 and ICAO ACP/WGS

AEEC Subcommittees: as required AGCS, AOC, DLK, others TBD

3.0 Project Scope

3.1 Description

INTRODUCTION

AeroMACS (Airport Mobile Access Communication System) is one of the new data links proposed in the Future Communications Infrastructure (FCI) and is intended to support the future airport surface communications.

AeroMACS is identified in the ICAO COM roadmap and the ICAO Global Air

Navigation Capacity and Enhancement Plan (GANP) strategy (as a Block 2 element) and is scheduled to operate in protected AM(R)S spectrum. AeroMACS is designed to support both safety of life (Air Traffic Management, ATM) and regularity of flight (Aeronautical Operational Control, AOC) operations. AeroMACS is based on the IEEE 802.16 standard (WiMAX) and will deliver an IP-based high data rate radio link, which will be used to support existing as well as enable future (advanced) aircraft-to-ground (ATS) and (AOC) services. In addition AeroMACS can enable and support SWIM type of services in the airport surface environment.

The AeroMACS protocols and features are covered in the AeroMACS profile which is a selected subset of the WiMAX and IEEE 802.16 standard providing the minimum requirements that are needed to support global interoperability. The AeroMACS profile has been jointly standardized in EUROCAE and RTCA and is also a recognized profile of the WiMAX commercial standard, aiming to facilitate the availability of equipment.

Furthermore, RTCA (SC-223) and EUROCAE (WG-82) have jointly developed AeroMACS Minimum Operational Performance Standards (MOPS) covering the ground and airborne side and EUROCAE is continuing now with the development of the AeroMACS Minimum Aviation System Performance Standards (MASPS).

Finally, ICAO ACP WGS is finalizing the AeroMACS SARPS and will also develop an AeroMACS Technical Manual.

The AEEC standardization effort is proposed to develop the required avionics specification to cover the items such as:

- Airborne transceiver form, fit, function, interface, definition capable of operating in the MLS Extension Band 5000 to 5150 MHz
- Avionics architecture
- Interfaces to airborne peripherals, i.e., control/display functions, central maintenance functions, etc. (Items to be considered are the need or not to identify aircraft network domain (ACD, AISD), message structure, specific equipment interfaces (CMU, ATSU, MCDU, etc.) and data destination management.)
- Integration with related broadband systems
- Segregation from unrelated functions
- Aircraft installation guidelines
- Antennas and cabling
- Others items [TBD]

The above list will be revisited and finalized at the end of the step 1 activity, in which the scope of the AeroMACS specification will be defined in detail.

BACKGROUND

During WRC07 the extended MLS band between 5091 and 5150 MHz was opened for ATC/AOC communication by including a co-primary AM(R)S allocation. Because of its short wavelength and the resulting propagation characteristics this frequency band is primarily suitable for short ranges in particular the airport surface.

During the period from 2005 up to 2007 EUROCONTROL and FAA co-operated

under Action Plan 17 in the development of a future communication infrastructure (FCI) that would be required to support the emerging future concepts as identified today in SESAR and NextGen.

As a result of the FCI study, Eurocontrol and FAA decided to co-operate in the standardization of AeroMACS system – based on IEEE 802.16.

For efficient operations Airlines and Airport operators rely more and more on high data rate IP based applications. Aircraft gate turnaround times can be optimized by providing high data rate radio links - such as AeroMACS - allowing the timely availability of all data required in order to speed-up aircraft arrival and departure procedures. Most of the bandwidth hungry AOC applications are being transferred between AOC centers and aircraft at the gate (software loading, EFB, etc.). Future ATC operations may rely also on new ATC commands while existing ATC messages could be offloaded from existing VDLM2 data links while transmitting on the airport surface.

PATENTS RELATED ISSUES

Just as any other modern commercial mobile communication system available on the market (based on commercial standards such as CDMA 2000, GSM, etc.), WiMAX is likely to be subject to patents. All patents issued for WiMAX (and therefore potentially applicable to AeroMACS) are centralized within the WiMAX Forum (<http://www.wimaxforum.org/resources/ipr>). The WiMAX Forum policy in accepting patents is compatible with the ITU and ICAO policy and allows patents as long as they are made available on a fair and non-discriminatory base.

In general any specific patents and owner of patents need to be identified, and commitment for licensing from the patents owners shall be addressed, as defined by the ARINC patent policy.

As the general idea is to implement AeroMACS based on an existing COTS product, the individual user will not see any patent issues as it will be part of the overall cost. It is believed that patents costs are in the order of 5% of the COTS unit cost (actual cost will depend on previous quantitative roll out of available COTS product and are thus only known to the COTS manufacturer).

TASKING

As mentioned previously, it is proposed to carry out the work in two steps and to start the work in the SAI group for step 1 and then decide the best way to proceed to the step 2 activities which will involve the drafting of the specification.

AeroMACS operates in protected spectrum and needs to support not only regularity of flight (AOC) services but also safety of life applications (ATM). As a result AeroMACS may have specific certification and accreditation requirements, for example more stringent than Gatelink.

This standard should target both forward fit installations as well as retrofit installations - if deemed commercially interest.

Potential areas of standardization include:

- FFF box dimensioning for both commercial and business aircraft (if possible)
 - For new developments

- Define and specify detailed Interfaces to airborne peripherals, i.e., control/display functions, central maintenance functions, etc.
- Propose and define Integration with related broadband and future ATC communication systems
- Define segregation principles from unrelated functions
- Ensure interoperability with other applicable ARINC standards
- Aircraft installation guidelines
- AeroMACS Antennas and cabling specifications
- Other items (TBD)

List to be revisited at end of step1 activity

4.0 Benefits

4.1 Basic benefits

- Operational enhancements yes no
- For equipment standards:
- a. Is this a hardware characteristic? yes no
- b. Is this a software characteristic? yes no
- c. Interchangeable interface definition? yes no
- d. Interchangeable function definition? yes no
- If not fully interchangeable, please explain: _____
- Is this a software interface and protocol standard? yes no
- Specify: _____
- Product offered by more than one supplier yes no
- Identify: Selex ES, Harris, Honeywell, Hitachi

4.2 Specific project benefits (Describe overall project benefits.)

This section describes the capabilities that are expected to be provided to the aircraft and ground by the installation and operation of AeroMACS.

Due to the use of an all IP radio, the radio can be easily integrated in existing AOC networks or future networks such as PENS (Pan European Network Services) in Europe.

Much higher radio data throughputs will be made available at airport surface compared to existing avionics systems used today such as ACARS or ATN/OSI (VDLM2). While Gatelink (WiFi) is also providing high data throughputs the public ISM band is getting saturated in some regions due to the high interference levels encountered. AeroMACS should not encounter this problem as it will operate in dedicated spectrum reserved for aviation. AeroMACS additionally offers a more remote connectivity to aircraft moving on the taxiways or parked on the apron far from a gate.

AeroMACS will be the first data link that will require IP access into the cockpit. Therefore the AeroMACS work will also facilitate the integration of future IP based ATC radios such as LDACS and the SBB or future SATCOM.

4.2.1 Benefits for Airlines

Airlines will be able to rely on a high-speed data rate connection located in protected (interference free) spectrum and will be able to optimize the airport surface communication between their aircraft and AOC center. The timely availability of needed information on aircraft status will allow faster turnaround times at the gate.

AeroMACS can also be considered as one of the future radio components bringing SWIM to the aircraft (Aircraft Access to SWIM - AAtS).

Because AeroMACS is an all IP radio, integration with existing local AOC IP ground network infrastructure should be simplified.

Several ATC data messages have been identified in the COCR to be carried over AeroMACS (DLL, D-ATIS, DCL, D-OTIS, D-SIG, D-SIGMET, D-TAXI, FLIPCY, FLIPINT, COTRAC (phase 2 ramp) etc.). Some messages are already sent over VDLM2 and will be transferred over AeroMACS to create more capacity on existing European congested VDLM2 channels. Other messages are new and are part of the effort to reduce gate turnaround time or are linked to new 4D trajectory based ATM operations.

Some other (not COCR based) ATC messages are being identified by FAA and are intended to run over AeroMACS as well.

4.2.2 Benefits for Airframe Manufacturers

Airframe Manufacturers could provide diverse communication link options such as AeroMACS – Gatelink to their customers. As multiple avionics equipment suppliers are interested in delivering AeroMACS the airframe manufacturers may offer different supplier choices to their customers.

4.2.3 Benefits for Avionics Equipment Suppliers

Equipment suppliers could benefit from this standard because the common interface description will allow them to provide their radio offering in several configurations.

5.0 Documents to be Produced and Date of Expected Result

ARINC Project Paper 7xx: AeroMACS Avionics Specification

5.1 Meetings and Expected Document Completion

The following table identifies the number of meetings and proposed meeting days needed to produce the documents described above.

Product/Activity	Mtgs	Mtg-Days (Total)	Expected Start Date	Expected Completion Date
Step 1 - AeroMACS Avionics Architecture	4	8 days (4x2)	June 2014	June 2015
Step 2 - ARINC Project Paper 7xx: AeroMACS Avionics Specification	4	8 days (4x2)	June 2015	June 2016

It is expected that 3 or 4 meeting in the context of planed SAI Subcommittee meetings will be required for Step 1 and the rest of the meetings to complete the work in Step 2. This APIM will be updated for step 2.

The in-person meetings will be augmented by web conferences held as necessary.

6.0 Comments

None

6.1 Expiration Date for this APIM

April 2017

Submit completed form to the AEEC Executive Secretary.