



The European Organisation for Civil Aviation Equipment  
L'Organisation Européenne pour l'Équipement de l'Aviation Civile

# MINIMUM OPERATIONAL PERFORMANCE STANDARDS (MOPS) FOR THE AERONAUTICAL MOBILE AIRPORT COMMUNICATION SYSTEM (AEROMACS)

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## **ED-223**

October 2013

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## FOREWORD

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## CHAPTER 1

### PURPOSE AND SCOPE

#### 1.1 INTRODUCTION

This document contains Minimum Operational Performance Standards for both the Airborne Component and Ground Based base station of the Aeronautical Mobile Airport Communication System (AeroMACS).

Compliance with these standards is recommended as one means of assuring that the equipment will perform its intended function(s) satisfactorily under all conditions normally encountered in routine aeronautical operation. Any regulatory application of this document is the sole responsibility of appropriate governmental agencies. These standards specify system characteristics that should be useful to designers, manufacturers, installers and users of the equipment.

Section 1 of this document provides information needed to understand the rationale for equipment characteristics and requirements stated in the remaining sections. It describes typical equipment operations and operational goals, as envisioned by the members of Special Committee 223 and Working Group 82, and establishes the basis for the standards stated in Sections 2 through 3. Definitions and assumptions essential to proper understanding of this document are also provided in this section.

Section 2 contains the Minimum Performance Standards for the equipment. These standards specify the required performance under standard environmental conditions. Also included are recommended bench test procedures necessary to demonstrate equipment compliance with the stated minimum requirements.

Section 3 describes the performance required for installed equipment. Tests for the installed equipment are included when performance cannot be adequately determined through bench testing.

Section 4 describes the operational performance characteristics for equipment installations and defines conditions that will assure the equipment user that operations can be conducted safely and reliably in the expected operational environment.

Appendix A - List of abbreviations and acronyms

Appendix B – Requirement Applicability

Appendix C – Example receiver sensitivity calculation

This document considers an equipment configuration consisting of AeroMACS radio and modem from antenna interface to the network interface. This MOPS addresses both Airborne Mobile Station and Ground Base Station components of the AeroMACS system.

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## 1.2 SYSTEM OVERVIEW – AeroMACS

This section provides an overview of Aeronautical Mobile Airport Communications System (AeroMACS) broadband communications system. AeroMACS is based on a specific commercial WiMax Forum profile, which is based on the IEEE 802.16 standard.

The 2005 amendment to the IEEE 802.16 2004 standard for local and metropolitan area networks, IEEE 802.16e, was recommended for aeronautical wireless mobile data communications on the airport surface. The recommendation resulted from technology assessment studies conducted under the Future Communications System study (FCS) jointly conducted by U.S. and Europe. International harmonization was carried out over multiple meetings of ICAO's Aeronautical Communications Panel (ACP) Communications Working Groups (WGC-8 through WGC-11) and Working Group Technology (WGT) to establish common solutions for future A/G data communications in the 2020 timeframe. An underlying objective of the FCS technology assessment was to maximize existing technologies and standards and minimize any modifications to each. This approach leveraged existing commercial industry resources invested in developing and standardizing the technology and can expedite ICAO approval as an international aviation standard.

AeroMACS is based on the IEEE 802.16-2009 standard, Part 16: Air Interface for Broadband Wireless Access Systems [1]. This standard is well suited for implementation below 11-GHz. The amendment for mobility uses 512 sub-carrier (in 5-MHz channel) scalable orthogonal frequency division multiple access (S-OFDMA) modulation and supports multiple channel bandwidths from 1.25- to 20-MHz, with peak duplex data rates above 50-Mbps. Some of the features of the IEEE 802.16 mobile standard that makes it attractive for use on the airport surface are highlighted in TABLE 1: FEATURES OF IEEE 802.16 DESIRABLE FOR IMPLEMENTATION OF AEROMACS NETWORKS below.

**TABLE 1: FEATURES OF IEEE 802.16 DESIRABLE  
FOR IMPLEMENTATION OF AEROMACS NETWORKS**

|                              |                                                                                                                          |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| • Mobility                   | Supports vehicle speeds of up to 120 km/hr , sufficient for aircraft taxiing and emergency surface vehicle speeds        |
| • Range                      | Covers up to ~10 km in line-of-sight (LOS) communications, sufficient to cover most airports                             |
| • Link Obstruction Tolerance | Exploits multipath to enable non line-of-site (NLOS) communications                                                      |
| • Quality of Service (QoS)   | Enables QoS based on throughput rate, packet error rate deletion, scheduling, time delay and jitter, resource management |
| • Scalability                | Includes flexible bandwidth and channelization options to enables network growth on demand                               |
| • Security                   | Includes mechanisms for authentication, authorization, encryption, digital certificates, and fast handovers              |
| • Privacy                    | Supports private Virtual Local Area Networks (VLANs)                                                                     |
| • Open Sourced               | Leverages modern communications technologies and supports modern Internet-based network protocols                        |
| • Cost Efficiency            | Via commercial standards and components, industry capabilities, and reduced physical infrastructure                      |

AeroMACS is based on a specific WiMAX Forum® profile of the IEEE 802.16 standard. This enables the aviation community to leverage extensive international standards collaboration and commercially-provided components and services.<sup>1</sup> The AeroMACS profile closely follows the format and substance of profiles developed by the WiMAX Forum® for commercial and industrial use. The WiMAX Forum® is an industry consortium whose primary technical function is to develop the technical specifications underlying WiMAX Forum Certified™ products.

The profile is expected to be incorporated as one of several WiMAX Forum Certified™ profiles.

An AeroMACS based on the WiMAX™ standard for local area networks can potentially support a wide variety of data, video, and voice communications and information exchanges among mobile users at the airport. The airport Communications, Navigation, and Surveillance (CNS) infrastructure that supports Air Traffic Management (ATM) and Air Traffic Control (ATC) on the airport surface can also benefit from secure wireless communications with improved availability and diversity. A wideband communications network can enable sharing of graphical data and near real-time video to significantly increase situational awareness, improve surface traffic movement to reduce congestion and delays, and help prevent runway incursions. AeroMACS can provide temporary communications capabilities during construction or outages, and reduce the cost of connectivity. A broadband wireless communications system like AeroMACS can enhance collaborative decision making, ease updating of large databases, provide up-to-date weather graphics and aeronautical information (Aeronautical Information and Meteorological Services), and enable aircraft access to System Wide Information Management (SWIM) services and delivery of time-critical advisory information to the cockpit.

### 1.2.1

#### Document Hierarchy

This document has precedence over the referenced documents here-in such as WiMax, IEEE Standards etc. The AeroMACS PICS and CRSL referenced in this document define the test procedures for AeroMACS.

Within this document the following conventions are used:

INFORMATIVE – Used when the corresponding paragraphs of reference [1] contain no requirements however, that material should be consulted for overall understanding.

IO-MIMO – Requirements that are labeled [IO-MIMO] are MIMO requirements and are not required for all AeroMACS implementations. If however a choice has been made to implement these optional MIMO capabilities they must meet the requirements as defined by this document and will require additional test procedures beyond what is specified within this document.

IO-ETH – Requirements that are labeled [IO-ETH] are Ethernet I/O requirements and are not required for all AeroMACS implementations. If however, a choice has been made to implement these optional Ethernet I/O capabilities, they must meet the requirements as defined by this document and will require additional test procedures beyond what is specified within this document.

IO-64QAM – Requirements that are labeled [IO-64QAM] are 64-QAM requirements and are not required for all AeroMACS implementations. If however, a choice has been made to implement these optional 64-QAM capabilities, they must meet the requirements as defined by this document and will require additional test procedures beyond what is specified within this document.

---

<sup>1</sup> WMF-T32-001-R010v09 - WiMAX Forum® Network Architecture - Architecture Tenets, Reference Model and Reference Points Part 0 - Release 1.0, available from <http://www.wimaxforum.org/resources/documents/technical/release> >

IO-CM – Requirements that are labeled [IO-CM] are Compressed Maps requirements and are not required for all AeroMACS implementations. If however, a choice has been made to implement these optional Compressed Maps capabilities, they must meet the requirements as defined by this document and will require additional test procedures beyond what is specified within this document.

IO-IPV6 – Requirements that are labeled [IO-IPV6] are IP version 6 requirements and are not required for all AeroMACS implementations. If however, a choice has been made to implement these optional IP Version 6 capabilities, they must meet the requirements as defined by this document and will require additional test procedures beyond what is specified within this document.

NA – Indicates that the sections is not applicable to AeroMACS and hence are not requirements on the implementation.

Requirements that are stated in the form of “AeroMACS shall ...” are applicable to both the Airborne MS and Ground BS components of AeroMACS. Requirements that are stated in the form of “The AeroMACS MS shall...” or “The AeroMACS BS shall ...” are applicable only to the MS or BS as indicated.

### 1.3

#### OPERATIONAL APPLICATION(S)

The community of potential AeroMACS users in an airport environment varies with the size of the airport facility. Airport Authority, Airlines and Civil Aviation Authority are principal airport tenants that deliver services and have a need to transport application information over a wireless network. User applications for transport over AeroMACS have been classified in 5 different functional domain categories. The functional domains are:

- Air Traffic Management/Air Traffic Control
- Aeronautical Information Services and Meteorological Data (AIS/MET)
- Aircraft Owner / Operator
- Airport Authority
- Airport Infrastructure

Applications identified and categorized in these 5 domains may have different performance characteristics, security needs, and quality of service requirements. The type of information content for each application ranges from live video streaming to low throughput system monitoring data exchanges.

Several applications belonging to different functional domains have been identified for consideration. Following is a sample of potential applications that can be transported over AeroMACS. Digital Notice to Airmen (D-NOTAM), the next generation NOTAM, are created and transmitted by government agencies to alert pilots of hazards in the NAS. D-NOTAM has been identified as a strong candidate application for transport over AeroMACS. Digital Taxi-Graphical and digital Air Traffic Information System (D-ATIS) are applications that are currently transported using ACARS. Both D\_Taxi and D-ATIS have been noted as candidates for implementation over AeroMACS. Future applications such as 4D Trajectory Data Link (4DTRAD) leverage advanced avionics to manage the end-to-end aircraft trajectory. 4DTRAD for surface movement application is under consideration for transport over the AeroMACS network. Airport Infrastructure equipment such Airport Surface Detection Equipment (ASDE-X) has long been identified as an application that could benefit from a wireless communications technology.

Mobile stations support both mobile and stationary applications on the airport surface. The following sections describe some potential examples of each. Operation in the RF Physical domain will be identical for all mobile stations.

### 1.3.1 Mobile Applications Examples

- ATC Communications with any aircraft anywhere on the airport surface.
  - ATC communications with any vehicle in the airport movement area (runway and taxiways)
  - Tower Data Link System (TDLS) for flight clearances
  - Loading FMS via CMU with 4D trajectories and modifications
- AOC, Advisory, and non-ATS voice/data between airlines and pilot
  - Collaborative decision making and 4D trajectory negotiations
  - EFB data, GPS and AIS updates; hazards advisories; NOTAMS
  - Surface management, gate and ramp control
  - Graphical weather corresponding to 4D trajectory
- Mobile SWIM and airport surface users
  - Publish and subscribe; receive/“listen” only
  - Fire, safety, snow removal, de-icing (in movement area)
  - Airport operations security; security video from cockpit and cabin

### 1.4 INTENDED FUNCTION

The equipment shall perform its intended function, as defined by the manufacturer, and its proper use shall not create a hazard to the users of the airspace.

### 1.5 OPERATIONAL GOALS

The operational goal of the AeroMACS system is to provide advanced data communication means to augment the current existing capabilities on the airport surface.

### 1.6 ASSUMPTIONS

This document is written to address both the Airborne and Ground components of the system and has been written from the perspective of a single LRU design approach. This choice was made for convenience of authorship and in no way intended to restrict the possible design solutions. Final solutions may be single LRU, multiple LRU, or Cabinet Based IMA in nature.

### 1.7 TEST PROCEDURES

The test procedures specified in this document are intended to be used as one means of demonstrating compliance with the performance requirements defined in Section 2.2. Although specific test procedures are cited, it is recognized that other methods may be preferred. These alternate procedures may be used if they provide at least equivalent information. In such cases, the procedures cited herein should be used as one criterion in evaluating the acceptability of the alternate procedures. Users of this document should not infer performance requirements based on Test Procedures.

The order of tests specified suggests that the equipment be subjected to a succession of tests as it moves from design and design qualification, into operational use. For example, compliance with the requirements of Section 2 shall have been demonstrated as a precondition to satisfactory completion of the installed system tests of Section 3.

#### a. Environmental Tests

Environmental test requirements are specified in Subsection 2.3. The procedures and their associated limits are intended to provide a laboratory means of determining the electrical and mechanical performance of the equipment under environmental conditions expected to be encountered in actual operations.

b. Bench Tests

Bench test procedures are specified in Subsection 2.4. These tests provide a laboratory means of demonstrating compliance with the requirements of Subsection 2.2. Test results may be used by equipment manufacturers as design guidance, for monitoring manufacturing compliance and, in certain cases, for obtaining formal approval of equipment design.

c. Installed Equipment Considerations

Tests for the installed equipment are included when performance cannot be adequately determined through bench testing.

The installed equipment test procedures and their associated limits are specified in Section 3. Although bench and environmental test procedures are not included in the installed equipment test, their successful completion is a precondition to completion of the installed test. In certain instances, however, installed equipment test may be used in lieu of bench test simulation of such factors as power supply characteristics, Interference from or to other equipment installed on the aircraft, etc. Installed tests are normally performed under two conditions:

1. With the aircraft on the ground and using simulated or operational system inputs.
2. With the aircraft inflight using operational system inputs appropriate to the equipment under test.

Test results may be used to demonstrate functional performance in the intended operational environment.

d. Operational Tests

The operational tests are specified in Section 4. These test procedures and their associated limits are intended to be conducted by operating personnel as one means of ensuring that the equipment is functioning properly and can be reliably used for its intended function(s).

## 1.8

### DEFINITION OF TERMS

- Aerodrome: A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.
- Adaptive modulation: A system's ability to communicate with another system using multiple burst profiles and a system's ability to subsequently communicate with multiple systems using different burst profiles.
- BS (Base Station): A generalized equipment set providing connectivity, management, and control of the subscriber station (SS).
- BER (Bit Error Rate): number of bit errors divided by the total number of transferred bits during a studied time interval - measured after error decoder.
- Burst profile: Set of parameters that describe the uplink (UL) or downlink (DL) transmission properties associated with an interval usage code. Each profile contains parameters such as modulation type, forward error correction (FEC) type, preamble length, guard times, etc
- CPDLC: The ATN application Controller Pilot Data Link Communications
- Data transit delay. In accordance with ISO 8348, the average value of the statistical distribution of data delays. This delay represents the subnetwork delay and does not include the connection establishment.
- Downlink: The transmission direction from the base station (BS) to the mobile station (MS).
- FA (Frequency assignment): A logical assignment of downlink (DL) center frequency and channel bandwidth programmed to the base station (BS).

- HO (Handover): The process in which a mobile station (MS) migrates from the air-interface provided by one base station (BS) to the air-interface provided by another BS. A break-before-make HO is where service with the target BS starts after a disconnection of service with the previous serving BS.
- MS (Mobile Station): A station in the mobile service intended to be used while in motion or during halts at unspecified points. An MS is always a subscriber station (SS) unless specifically stated otherwise in this standard.
- N (Network): The word "network" and its abbreviation "N" in ISO 8348 are replaced by the word "subnetwork" and its abbreviation "SN", respectively, whenever they appear in relation to the subnetwork layer packet data performance.
- Network Entry Time: The time from when the SS first attempts to determine the channel to tx on (e.g. scanning) until the first network user pdu can be sent. Note: does not include time for self test or other power up functions.
- PtP (Point-to-point): A mode of operation whereby a link exists between two network entities.
- Residual error rate: The ratio of incorrect, lost and duplicate subnetwork service data units (SNSDUs) to the total number of SNSDUs that were sent.
- SF (Service flow): A unidirectional flow of medium access control layer (MAC) service data units (SDUs) on a connection that is provided a particular quality of service (QoS).
- SS (Subscriber Station): A generalized equipment set providing connectivity between subscriber equipment and a base station (BS).
- SN (Subnetwork): See Network (N)
- SDU (Service data unit): The data unit exchanged between two adjacent protocol layers. On the downward direction, it is the data unit received from the previous higher layer. On the upward direction, it is the data unit sent to the next higher layer.
- SNSDU (Subnetwork service data unit): An amount of subnetwork user data, the identity of which is preserved from one end of a subnetwork connection to the other.
- TDD (Time division duplex): A duplex scheme where uplink (UL) and downlink (DL) transmissions occur at different times but may share the same frequency.
- Uplink: The direction from a mobile station (MS) to the base station (BS).

## 1.9 ANTICIPATED FUTURE GROWTH

None specified.

## 1.10 REFERENCE DOCUMENTS

This document uses shorthand references to other documents. The references and full identification of the applicable documents are as given below. The reference documents of the exact data and issue, including changes, apply unless otherwise noted.

1. IEEE 802.16-2009, IEEE Standard for Local and metropolitan area networks Part 16: Air Interface for Broadband Wireless Access Systems
2. WMF-T24-003-R010v01, WiMAX Forum ® AeroMACS Protocol Implementation Conformance Statement (PICS) Proforma

**NOTE:** See *Proprietary Disclaimer* in section 1.1

3. EUROCAE ED-12B / RTCA DO-178B, Software Considerations in Airborne Systems and Equipment Certification (December 1, 1992)

4. WMF-T32-003-R010v05, WiMAX Forum® Network Architecture : Architecture Tenets, Reference Model and Reference Points (2009-03-19)
5. WiMAX Forum ® Certification Requirements Status List (CRSL) Release 18.0.0 or later

**NOTE:** See *Proprietary Disclaimer* in section 1.1

6. EUROCAE ED-14G / RTCA DO-160G Environmental Conditions and Test Procedures for Airborne Equipment (December 8, 2010)
7. EUROCAE ED-222 / RTCA DO-345, Aeronautical Mobile Airport Communications System Profile (December 18, 2013)
8. Profile Simon, et al., "EAP-TLS Authentication Protocol", RFC 5216, March 2008
9. International Telecommunication Union, "Information technology - Open systems interconnection - The Directory: Public-key and attribute certificate frameworks", ITU-T Recommendation X.509 | ISO/IEC 9594-8, 11/2008
10. Internet Protocol, RCF 791, September 1981
11. Internet Protocol, Version 6, RFC 2460, December 1998

## CHAPTER 2

### MINIMUM PERFORMANCE STANDARDS

#### 2.1 GENERAL DESIGN REQUIREMENTS

##### 2.1.1 Effect of Test

The equipment shall be designed so that the application of specified test procedures shall not be detrimental to equipment performance following the application of the tests, except as specifically allowed.

##### 2.1.2 Intended Function

The equipment shall perform its intended function(s), as defined by the manufacturer, and its proper use shall not create a hazard to other users of the National Airspace System.

##### 2.1.3 ITU Regulations and Federal Communications Commission Rules

The equipment shall comply with the relevant International Telecommunications Union (ITU-R) Radio Regulations and FCC Regulations or such other requirements as applicable.

##### 2.1.4 Equipment Classes

This AeroMACS MOPS defines two equipment classes Base Stations (BS) which are stations that are installed at fixed locations on the airport surface, and Airborne Mobile Stations (MS) which are mobile stations that are installed within an aircraft.

##### 2.1.5 Airborne - General Design Requirements

###### 2.1.5.1 Software Management

If the equipment design is implemented using digital computer techniques, the computer software package(s) shall follow guidelines contained in EUROCAE / RTCA document ED-12B / DO-178B "Software Considerations in Aircraft Systems and Equipment Certification." The equivalent of later editions of ED-12B / DO-178(B) may be used with the agreement of the authority.

###### 2.1.5.2 Airworthiness

In the design and manufacture of the equipment, the manufacturer shall provide for installation so as not to impair the airworthiness of the aircraft.

###### 2.1.5.3 Fire Protection

All materials used shall be self-extinguishing except for small parts (such as knobs, fasteners, seals, grommets, and small electrical parts) that would not contribute significantly to the propagation of a fire.

**NOTE:** One means of showing compliance is contained in Federal Aviation Regulations (FAR), Part 25, Appendix F and/or Part 23 Appendix F.

###### 2.1.5.4 Operation of Controls

The equipment shall be designed so that controls intended for use during flight cannot be operated in any position, combination or sequence that would result in a condition detrimental to the reliability of the equipment or operation of the aircraft.

###### 2.1.5.5 Design Assurance

Design Assurance Levels (DAL) should be adequate to mitigate the failure classification appropriate to the contribution of the equipment to the aircraft level failure in the aircraft in which it is to be installed. The DAL appropriate for a given hazard classification is not the same for all aircraft types and, the contribution of the equipment to an aircraft level failure may vary depending on the aircraft and other installed equipment.

#### 2.1.5.5.1 Accessibility of Controls

Controls that do not require adjustment during flight shall not be readily accessible to flight personnel.

#### 2.1.5.5.2 Display of Navigation Facility Identification

NA

### 2.1.6 Ground – General Design Requirements

#### 2.1.6.1 Controls and indicators

The user shall not have access to any control which, if wrongly set, might impair the technical characteristics of the equipment.

## 2.2 EQUIPMENT PERFORMANCE – STANDARD CONDITIONS

### 2.2.1 AeroMACS Operating Frequency Band

AeroMACS shall be tunable across the band 5000 MHz to 5150MHz, in 250 kHz steps with reference channel of 5145 MHz.

The reference channel only identifies a channel whose center frequency is included in the list of center frequencies that are to be tuned by AeroMACS and is a reference point for the identification of all other center frequencies that may be tuned by AeroMACS using the channel step size.

**NOTE:** *The core AeroMACS band is 5091-5150 MHz.*

**NOTE:** *Channels can be assigned in the sub-bands:  
5000-5030 MHz based on national regulations,  
5030-5091 MHz depending on frequency planning defined at ICAO level considering other Aeronautical applications.*

**NOTE:** *The 250kHz step size will allow AeroMACS to gracefully move away from any interference source such as MLS, AMT, or Military users located in the 5000-5150 MHz band.*

### 2.2.2 Supported Channel Bandwidth

AeroMACS shall implement only the 5 MHz bandwidth, with the corresponding FFT sizes of 512 points.

### 2.2.3 Reserved

NA

### 2.2.4 Reserved

NA

### 2.2.5 Service-specific CS

[INFORMATIVE]

#### 2.2.5.1 ATM CS

NA

#### 2.2.5.2 Packet CS

[INFORMATIVE]

#### 2.2.5.2.1 MAC SDU format

AeroMACS shall implement the MAC SDU format as described in [1], para 5.2.1.

#### 2.2.5.2.2 Classification

AeroMACS shall follow the classification rules – for the AeroMACS specific classification rules selected in the profiles as described in [1], para 5.2.2.

#### 2.2.5.2.3 Payload header suppression (PHS)

AeroMACS shall implement PHS as described in [1], para 5.2.3.

**2.2.5.2.3.1 PHS operation**

AeroMACS shall implement PHS operation as described in [1], para 5.2.3.1.

**2.2.5.2.3.2 PHS signaling**

AeroMACS shall implement PHS signaling as described in [1], para 5.2.3.2.

**2.2.5.2.4 IEEE 802.3/Ethernet-specific part**

[IO-ETH] If implementing the [IO-ETH] option, AeroMACS shall Implement IEEE 802.3/Ethernet as defined in ref [1] para 5.2.4.

**NOTE:** *Ethernet CS can optionally be implemented in the MS, the BS or both.*

**2.2.5.2.4.1 IEEE 802.3/Ethernet CS PDU format**

[IO-ETH] If implementing the [IO-ETH] option, AeroMACS shall implement IEEE 802.3/Ethernet CS PDU format as defined in [1], para 5.2.4.1.

**2.2.5.2.4.2 IEEE 802.3/Ethernet CS classification rules**

[IO-ETH] If implementing the [IO-ETH] option, AeroMACS shall implement IEEE 802.3/Ethernet CS classification rules as defined in ref [1], para 5.2.4.2.

**2.2.5.2.5 IP specific part**

AeroMACS shall implement IETF RFC 791 [10] as defined in ref [1], para 5.2.5.

[IO-IPV6] if implementing the [IO-IPV6] option, AeroMACS shall implement IETF RFC 2460 [xx] as defined in ref [1], para 5.2.5.

**2.2.5.2.5.1 IP CS PDU format**

AeroMACS shall implement the IP CS PDU format as defined in [1], para 5.2.5.1.

**NOTE:** *ROHC is NA for AeroMACS.*

**2.2.5.2.5.2 IP classification rules**

AeroMACS shall implement the IP classification rules as described in [1], para 5.2.5.2.

**2.2.5.3 Generic Packet Convergence Sublayer (GPCS)**

NA

**2.2.6 MAC common part sub-layer****2.2.6.1 Point to multipoint (PMP) operation overview**

[INFORMATIVE]

**2.2.6.2 Reserved****2.2.6.3 Data and Control Plane****2.2.6.3.1 Addressing and connections****2.2.6.3.1.1 Point-to-multipoint (PMP)**

AeroMACS shall implement the PMP functions as defined in [1], para 6.3.1.1.

**2.2.6.3.2 MAC PDU formats**

AeroMACS shall implement the MAC PDU formats as defined in [1], para 6.3.2.

**2.2.6.3.2.1 MAC header formats**

AeroMACS shall implement the MAC header formats as defined in [1], para 6.3.2.1.

**2.2.6.3.2.1.1 Generic MAC header**

AeroMACS shall implement the generic MAC header format as defined in [1], para 6.3.2.1.1.

**2.2.6.3.2.1.2 MAC header without payload**

[INFORMATIVE]

#### 2.2.6.3.2.1.2.1 MAC signaling header type I

AeroMACS shall implement the MAC signaling header type I as defined in [1], para 6.3.2.1.2.1.

##### 2.2.6.3.2.1.2.1.1 Bandwidth request (BR) header

AeroMACS shall implement BR request header as defined in [1], para 6.3.2.1.2.1.1.

##### 2.2.6.3.2.1.2.1.2 Bandwidth request and UL Tx power report header

AeroMACS shall implement bandwidth request and UL Tx report header as defined in [1], para 6.3.2.1.2.1.2.

##### 2.2.6.3.2.1.2.1.3 BR and CINR report header

NA

##### 2.2.6.3.2.1.2.1.4 CQICH allocation request header

NA

##### 2.2.6.3.2.1.2.1.5 PHY channel report header

NA

##### 2.2.6.3.2.1.2.1.6 BR and UL sleep control header

NA

##### 2.2.6.3.2.1.2.1.7 SN report header

NA

#### 2.2.6.3.2.1.2.2 MAC signaling header type II

NA

##### 2.2.6.3.2.1.2.2.1 Feedback header

NA

##### 2.2.6.3.2.1.2.2.2 MIMO channel feedback header

NA

#### 2.2.6.3.2.2 MAC subheaders and special payloads

[INFORMATIVE]

##### 2.2.6.3.2.2.1 Fragmentation subheader (FSH)

AeroMACS shall implement Fragmentation subheader as defined in [1], para 6.3.2.2.1.

##### 2.2.6.3.2.2.2 Grant management subheader (GMSH)

AeroMACS shall implement Grant management sub header as defined in [1], para 6.3.2.2.2.

##### 2.2.6.3.2.2.3 Packing subheader (PSH)

AeroMACS shall implement Packing of variable-length SDUs as defined in [1], para 6.3.2.2.3.

##### 2.2.6.3.2.2.4 ARQ/Feedback

NA

##### 2.2.6.3.2.2.5 Reserved

NA

##### 2.2.6.3.2.2.6 Fast-feedback allocation subheader (FFSH)

NA

- 2.2.6.3.2.2.7 Extended subheader format  
NA
- 2.2.6.3.2.2.7.1 SDU SN extended subheader  
NA
- 2.2.6.3.2.2.7.2 DL sleep control extended subheader  
NA
- 2.2.6.3.2.2.7.3 Feedback request extended subheader  
NA
- 2.2.6.3.2.2.7.4 MIMO mode feedback extended subheader  
NA
- 2.2.6.3.2.2.7.5 UL Tx power report extended subheader  
NA
- 2.2.6.3.2.2.7.6 Mini-feedback extended subheader  
NA
- 2.2.6.3.2.2.7.7 SN request extended subheader  
NA
- 2.2.6.3.2.2.7.8 PDU SN extended subheader  
NA
- 2.2.6.3.2.2.7.9 ertPS resumption bitmap extended subheader  
NA
- 2.2.6.3.2.2.7.10 Persistent Allocation Error Event  
NA

#### **2.2.6.3.2.3 MAC management messages**

AeroMACS shall implement the MAC management messages as defined in [1], para 6.3.2.3.

The Type Length Value(s) (TLV) for each of the MAC management message shall be as defined in [2] or equivalent.

- 2.2.6.3.2.3.1 DCD (DL channel descriptor) message  
AeroMACS shall implement the DCD message as defined in [1], para 6.3.2.3.1.
- 2.2.6.3.2.3.2 DL-MAP (Downlink map) message  
AeroMACS shall implement the DL-MAP message as defined in [1], para 6.3.2.3.2.
- 2.2.6.3.2.3.3 UCD (UL channel descriptor) message  
AeroMACS shall implement the UCD message as defined in [1], para 6.3.2.3.3.
- 2.2.6.3.2.3.4 UL-MAP (UL map) message  
AeroMACS shall implement the UL-MAP message as defined in [1], para 6.3.2.3.4.
- 2.2.6.3.2.3.5 RNG-REQ (ranging request) message  
AeroMACS shall implement the RNG-REQ message as defined in [1], para 6.3.2.3.5.
- 2.2.6.3.2.3.6 RNG-RSP (ranging response) message  
AeroMACS shall implement RNG-RSP message as defined in [1], para 6.3.2.3.6.
- 2.2.6.3.2.3.7 REG-REQ (registration request) message  
AeroMACS shall implement REG-REQ message as defined in [1], para 6.3.2.3.7.

- 2.2.6.3.2.3.8 REG-RSP (registration response) message  
AeroMACS shall implement REG-RSP message as defined in [1], para 6.3.2.3.8.
- 2.2.6.3.2.3.9 Privacy key management (PKM) messages (PKM-REQ/PKM-RSP)  
AeroMACS shall implement PKM messages as defined in [1], para 6.3.2.3.9.  
**NOTE:** *MIH Initial Request ([1], para 6.3.2.3.9.26), MIH Acknowledge ([1], para 6.3.2.3.9.27), and MIH Comeback Response ([1], para 6.3.2.3.9.28) are NA for AeroMACS.*
- 2.2.6.3.2.3.10 DSA-REQ message  
AeroMACS shall implement the DSA-REQ message as defined in [1], para 6.3.2.3.10.
- 2.2.6.3.2.3.10.1 MS-Initiated DSA  
NA
- 2.2.6.3.2.3.10.2 BS-Initiated DSA  
AeroMACS shall implement BS-Initiated DSA as defined in [1], para 6.3.2.3.10.2.
- 2.2.6.3.2.3.11 DSA-RSP message  
AeroMACS shall implement the DSA-RSP message as defined in [1] para 6.3.2.3.11.
- 2.2.6.3.2.3.11.1 MS-Initiated DSA  
NA
- 2.2.6.3.2.3.11.2 BS-Initiated DSA  
AeroMACS shall implement BS-Initiated DSA as defined in [1], para 6.3.2.3.11.2.
- 2.2.6.3.2.3.12 DSA-ACK message  
AeroMACS shall implement the DSA-ACK message as defined in [1] para 6.3.2.3.12.
- 2.2.6.3.2.3.13 DSC-REQ (DSC request) message  
AeroMACS shall implement the DSA-REQ message as defined in [1], para 6.3.2.3.13.  
**NOTE:** *Only the BS is allowed to dynamically change the parameters of an existing service flow.*
- 2.2.6.3.2.3.14 DSC-RSP (DSC response) message  
AeroMACS shall implement the DSC-RSP message as defined in [1], para 6.3.2.3.14.
- 2.2.6.3.2.3.15 DSC-ACK (DSC acknowledge) message  
AeroMACS shall implement the DSC-ACK message as defined in [1], para 6.3.2.3.15.
- 2.2.6.3.2.3.16 DSD-REQ message  
AeroMACS shall implement the DSD-REQ message as defined in [1], para 6.3.2.3.16.  
**NOTE:** *Only the BS is allowed to delete an existing service flow.*
- 2.2.6.3.2.3.17 DSD-RSP message  
AeroMACS shall implement the DSD\_RSP message as defined in [1], para 6.3.2.3.17.
- 2.2.6.3.2.3.18 MCA-REQ (multicast polling assignment request) message  
NA
- 2.2.6.3.2.3.19 MCA-RSP (multicast polling assignment response) message  
NA
- 2.2.6.3.2.3.20 DBPC-REQ (DL burst profile change request) message  
NA

- 2.2.6.3.2.3.21 DBPC-RSP (DL burst profile change response) message  
NA
- 2.2.6.3.2.3.22 RES-CMD (reset command) message  
NA
- 2.2.6.3.2.3.23 SBC-REQ (SS basic capability request) message  
AeroMACS shall implement SBC-REQ message as defined in [1], para 6.3.2.3.23.
- 2.2.6.3.2.3.24 SBC-RSP (SS basic capability response) message  
AeroMACS shall implement SBC-RSP message as defined in [1], para 6.3.2.3.24.
- 2.2.6.3.2.3.25 CLK-CMP (clock comparison) message  
NA
- 2.2.6.3.2.3.26 DREG-CMD (de/reregister command) message  
AeroMACS shall implement the DREG-CMD message as defined in [1], para 6.3.2.3.26.
- 2.2.6.3.2.3.27 DSX-RVD (DSx received) message  
NA
- 2.2.6.3.2.3.28 TFTP-CPLT (Config File TFTP complete) message  
NA
- 2.2.6.3.2.3.29 TFTP-RSP (Config File TFTP complete response) message  
NA
- 2.2.6.3.2.3.30 ARQ-Feedback message  
AeroMACS shall implement the ARQ-Feedback message as defined in [1], para 6.3.2.3.30.
- 2.2.6.3.2.3.31 ARQ-Discard message  
AeroMACS shall implement the ARQ-Discard message as defined in [1], para 6.3.2.3.31.
- 2.2.6.3.2.3.32 ARQ-Reset message  
AeroMACS shall implement the ARQ-Reset message as defined in [1], para 6.3.2.3.32.
- 2.2.6.3.2.3.33 Channel Measurement REP-REQ/RSP (report request/response)  
AeroMACS shall implement Channel Measurement REP-REQ/RSP as defined in [1], para 6.3.2.3.33
- 2.2.6.3.2.3.34 FPC (fast power control) message  
NA
- 2.2.6.3.2.3.35 AAS-FBCK-REQ/RSP (AAS channel feedback request/response) messages  
NA
- 2.2.6.3.2.3.36 AAS\_Beam\_Select message  
NA
- 2.2.6.3.2.3.37 DREG-REQ (SS deregistration request) message  
AeroMACS shall implement the DREG-REQ message as defined in [1], para 6.3.2.3.37.
- 2.2.6.3.2.3.38 HARQ MAP message  
NA

- 2.2.6.3.2.3.39 MOB\_SLP-REQ (sleep request) message  
NA
- 2.2.6.3.2.3.40 MOB\_SLP-RSP (sleep response) message  
NA
- 2.2.6.3.2.3.41 MOB\_TRF-IND (traffic indication) message  
NA
- 2.2.6.3.2.3.42 MOB\_NBR-ADV (neighbor advertisement) message  
AeroMACS shall implement MOB\_NBR-ADV message as defined in [1], para 6.3.2.3.42.
- 2.2.6.3.2.3.43 MOB\_SCN-REQ (scanning interval allocation request) message  
AeroMACS shall implement MOB\_SCN-REQ message as defined in [1], para 6.3.2.3.43.  
AeroMACS shall implement support for BS index as defined in [1], para 6.3.2.3.43.  
AeroMACS shall implement scanning for cell selection as defined in [1], para 6.3.2.3.43.  
AeroMACS shall implement MS Requests for Scanning Interval Allocations from the BS as defined in [1], para 6.3.2.3.43.
- 2.2.6.3.2.3.44 MOB\_SCN-RSP (scanning interval allocation response) message  
AeroMACS shall MOB\_SCN-RSP message as defined in [1], para 6.3.2.3.44.  
AeroMACS shall implement Support for BS index as defined in [1], para 6.3.2.3.44.  
AeroMACS shall implement Scanning for cell selection as defined in [1], para 6.3.2.3.44.
- 2.2.6.3.2.3.45 MOB\_SCN-REP (scanning result report) message  
The MS shall implement MOB\_SCN-REP as defined in [1], para 6.3.2.3.45
- 2.2.6.3.2.3.46 MOB\_ASC-REP (association result report) message  
NA
- 2.2.6.3.2.3.47 MOB\_BSHO-REQ (BS HO request) message  
NA
- 2.2.6.3.2.3.48 MOB\_MSHO-REQ (MS HO request) message  
AeroMACS shall implement MOB\_MSHO-REQ message as defined in [1], para 6.3.2.3.48.
- 2.2.6.3.2.3.49 MOB\_BSHO-RSP (BS HO response) message  
AeroMACS shall implement MOB\_BSHO-RSP message as defined in [1], para 6.3.2.3.49.
- 2.2.6.3.2.3.50 MOB\_HO-IND (HO indication) message  
AeroMACS shall implement MOB\_HO-IND message as defined in [1], para 6.3.2.3.50.
- 2.2.6.3.2.3.51 MOB\_PAG-ADV (BS broadcast paging) message  
NA
- 2.2.6.3.2.3.52 MBS\_MAP (multicast and broadcast service map) message  
NA
- 2.2.6.3.2.3.53 PMC\_REQ (power control mode change request) message  
AeroMACS shall implement the PMC\_REQ message as defined in [1], para 6.3.2.3.53.

- 2.2.6.3.2.3.54 PMC\_RSP (power control mode change response) message  
AeroMACS shall implement the PMC\_RSP message as defined in [1], para 6.3.2.3.54.
- 2.2.6.3.2.3.55 OFDMA SUB-DL-UL-MAP message  
NA
- 2.2.6.3.2.3.56 MIMO precoding setup/tear-down messages  
NA
- 2.2.6.3.2.3.57 MIH Payload Transfer (MOB\_MIH-MSG) message  
NA
- 2.2.6.3.2.3.58 Service Identity Information (SII-ADV) message  
AeroMACS shall implement Service Identity Information (SII-ADV) messages as defined in [1], para 6.3.2.3.58.
- 2.2.6.3.2.3.59 Location Based Services (LBS-ADV) message  
NA
- 2.2.6.3.3 Construction and transmission of MAC PDUs**  
[INFORMATIVE]
- 2.2.6.3.3.1 Conventions**  
AeroMACS shall implement data transmissions according to the rules as defined in [1], para 6.3.3.1.
- 2.2.6.3.3.2 Concatenation**  
AeroMACS shall implement concatenation of multiple MAC PDUs as defined in [1], para 6.3.3.2.
- 2.2.6.3.3.3 Fragmentation**  
AeroMACS shall implement fragmentation of MAC PDUs as defined in [1], para 6.3.3.3.
- 2.2.6.3.3.3.1 Non-ARQ connections  
AeroMACS shall implement fragmentation for non-ARQ connections as defined in [1], para 6.3.3.3.1.
- 2.2.6.3.3.3.2 ARQ-enabled connections  
AeroMACS shall implement ARQ-enabled connections as defined in [1], para 6.3.3.3.2.
- 2.2.6.3.3.4 Packing**  
[INFORMATIVE]
- 2.2.6.3.3.4.1 Packing for non-ARQ connections  
[INFORMATIVE]
- 2.2.6.3.3.4.1.1 Packing fixed-length MAC SDUs  
NA
- 2.2.6.3.3.4.1.2 Packing variable-length MAC SDUs  
AeroMACS shall implement packing of variable-length MAC SDUs as defined in [1], para 6.3.3.4.1.2.
- 2.2.6.3.3.4.2 Packing for ARQ-enabled connections  
AeroMACS shall implement packing of ARQ-enabled connections as defined in [1], para 6.3.3.4.2.

#### 2.2.6.3.3.4.3 Packing ARQ Feedback IEs

AeroMACS shall implement packing of ARQ feedback IEs as defined in [1], para 6.3.3.4.3.

#### 2.2.6.3.3.5 CRC calculation

[INFORMATIVE]

##### 2.2.6.3.3.5.1 CRC32 calculation for SC and OFDM mode

NA

##### 2.2.6.3.3.5.2 CRC32 calculation for OFDMA mode

AeroMACS shall implement CRC32 calculation for OFDMA mode as defined in [1], para 6.3.3.5.2.

##### 2.2.6.3.3.5.2.1 CRC32 test vectors for OFDMA mode

[INFORMATIVE]

#### 2.2.6.3.3.6 Encryption of MAC PDUs

AeroMACS shall implement encryption of MAC PDUs as defined in [1], para 6.3.3.6.

#### 2.2.6.3.3.7 Padding

AeroMACS shall implement padding as defined in [1], para 6.3.3.7.

#### 2.2.6.3.4 ARQ mechanisms

[INFORMATIVE]

##### 2.2.6.3.4.1 ARQ block usage

AeroMACS shall implement the ARQ block usage as defined in [1], para 6.3.4.1.

##### 2.2.6.3.4.2 ARQ Feedback IE format

AeroMACS shall comply with the format defined in [1], para 6.3.4.2, using the following ARQ ACK definitions:

**TABLE 2: ARQ ACK DEFINITIONS**

| ARQ ACK type | Definition |
|--------------|------------|
| 0            | NA         |
| 1            | Mandatory  |
| 2            | Mandatory  |
| 3            | NA         |

**NOTE:** ARQ ACK type 0 is not supported by the WiMax forum.

##### 2.2.6.3.4.2.1 ARQ Feedback IE format with extended capability

NA

#### 2.2.6.3.4.3 ARQ parameters

##### 2.2.6.3.4.3.1 ARQ\_BSN\_MODULUS

AeroMACS shall implement ARQ\_BSN\_MODULUS as defined in [1], para 6.3.4.3.1.

##### 2.2.6.3.4.3.2 ARQ\_WINDOW\_SIZE

AeroMACS shall implement ARQ\_WINDOW\_SIZE as defined in [1], para 6.3.4.3.2.

##### 2.2.6.3.4.3.3 ARQ\_BLOCK\_LIFETIME

AeroMACS shall implement ARQ\_BLOCK\_LIFETIME as defined in [1], para 6.3.4.3.3.

##### 2.2.6.3.4.3.4 ARQ\_RETRY\_TIMEOUT

AeroMACS shall implement ARQ\_RETRY\_TIMEOUT as defined in [1], para 6.3.4.3.4.

#### 2.2.6.3.4.3.5 ARQ\_SYNC\_LOSS\_TIMEOUT

AeroMACS shall implement ARQ\_SYNC\_LOSS\_TIMEOUT as defined in [1], para 6.3.4.3.5.

#### 2.2.6.3.4.3.6 ARQ\_RX\_PURGE\_TIMEOUT

AeroMACS shall implement ARQ\_RX\_PURGE\_TIMEOUT as defined in [1], para 6.3.4.3.6.

#### 2.2.6.3.4.3.7 ARQ\_BLOCK\_SIZE

AeroMACS shall implement ARQ\_BLOCK\_SIZE as defined in [1], para 6.3.4.3.7.

### 2.2.6.3.4.4 ARQ procedures

#### 2.2.6.3.4.4.1 ARQ state machine variables

AeroMACS shall implement ARQ state machine variables as defined in [1], para 6.3.4.4.1.

##### 2.2.6.3.4.4.1.1 Transmitter variables

AeroMACS shall implement transmitter variables as defined in [1], para 6.3.4.4.1.1.

##### 2.2.6.3.4.4.1.2 Receiver variables

AeroMACS shall implement the receiver variables as defined in [1], para 6.3.4.4.1.2.

### 2.2.6.3.4.5 ARQ-enabled connection setup and negotiation

AeroMACS shall implement ARQ-enabled connection setup and negotiation as defined in [1], para 6.3.4.5.

### 2.2.6.3.4.6 ARQ operation

#### 2.2.6.3.4.6.1 Sequence number comparison

AeroMACS shall implement ARQ operation with sequence number comparison as defined in [1], para 6.3.4.6.1.

#### 2.2.6.3.4.6.2 Transmitter state machine

AeroMACS shall implement ARQ operation with transmitter state machine as defined in [1], para 6.3.4.6.2.

#### 2.2.6.3.4.6.3 Receiver state machine

AeroMACS shall implement ARQ operation with receiver state machine as defined in [1], para 6.3.4.6.3.

### 2.2.6.3.5 Scheduling services

[INFORMATIVE]

#### 2.2.6.3.5.1 Outbound transmission scheduling

[INFORMATIVE]

#### 2.2.6.3.5.2 UL request/grant scheduling

[INFORMATIVE]

##### 2.2.6.3.5.2.1 Unsolicited grant service (UGS)

AeroMACS shall implement unsolicited grant service (IGS) as defined in [1], para 6.3.5.2.1.

##### 2.2.6.3.5.2.2 Real-time polling service (rtPS)

AeroMACS shall implement Real Time Variable rate (RT-VR) as defined in [1], para 6.3.5.2.2.

#### 2.2.6.3.5.2.2.1 Extended rtPS

AeroMACS shall implement extended real time variable rate as defined in [1], para 6.3.5.2.2.1.

#### 2.2.6.3.5.2.3 Non-real-time polling service (nrtPS)

AeroMACS shall implement Non-Real Time- Variable Rate (NRT-VR) as defined in [1], para 6.3.5.2.3.

#### 2.2.6.3.5.2.4 Best effort (BE) service

AeroMACS shall implement Best Effort (BE) services as defined in [1], para 6.3.5.2.4.

### 2.2.6.3.6 Bandwidth allocation and request mechanisms

[INFORMATIVE]

**NOTE:** *AeroMACS initiates two dedicated CIDs for the purpose of sending and receiving management messages (i.e. basic and primary management connection).*

#### 2.2.6.3.6.1 Requests

AeroMACS shall implement aggregate and incremental bandwidth requests (BE) as defined in [1], para 6.3.6.1.

#### 2.2.6.3.6.2 Grants

AeroMACS shall implement Grants as defined in [1], para 6.3.6.2.

#### 2.2.6.3.6.3 Polling

AeroMACS shall implement Polling as defined in [1], para 6.3.6.3.

##### 2.2.6.3.6.3.1 Unicast polling

AeroMACS shall implement unicast polling as described in [1], para 6.3.6.3.1.

##### 2.2.6.3.6.3.2 Multicast and broadcast polling

NA

##### 2.2.6.3.6.3.3 PM bit

AeroMACS shall implement PM bit as defined in [1], para 6.3.6.3.3.

#### 2.2.6.3.6.4 Contention-based focused BRs for WirelessMAN-OFDM

NA

#### 2.2.6.3.6.5 Contention-based CDMA BRs for WirelessMAN-OFDMA

AeroMACS shall implement Contention-based CDMA BRs for WirelessMAN-OFDMA as defined in [1], para 6.3.6.5.

### 2.2.6.3.7 MAC support of PHY

[INFORMATIVE]

#### 2.2.6.3.7.1 Frequency division duplexing (FDD)

NA

#### 2.2.6.3.7.2 Time division duplexing (TDD)

AeroMACS shall implement TDD as defined in [1], para 6.3.7.2.

#### 2.2.6.3.7.3 DL-MAP message

[INFORMATIVE]

#### 2.2.6.3.7.4 UL-MAP message

[INFORMATIVE]

- 2.2.6.3.7.4.1 UL timing  
[INFORMATIVE]
- 2.2.6.3.7.4.2 UL allocations  
[INFORMATIVE]
- 2.2.6.3.7.4.3 UL interval definition  
[INFORMATIVE]
- 2.2.6.3.7.4.3.1 Request IE  
NA
- 2.2.6.3.7.4.3.2 Initial ranging IE  
NA
- 2.2.6.3.7.4.3.3 Data Grant Burst Type IEs  
NA
- 2.2.6.3.7.4.3.4 End of Map IE  
NA
- 2.2.6.3.7.4.3.5 Gap IE  
NA
- 2.2.6.3.7.5 Map relevance and synchronization**  
[INFORMATIVE]
- 2.2.6.3.7.5.1 WirelessMAN-SC PHY  
NA
- 2.2.6.3.7.5.2 WirelessMAN-OFDM PHY  
NA
- 2.2.6.3.7.5.3 WirelessMAN-OFDMA PHY  
AeroMACS shall implement WirelessMAN-OFDMA PHY as defined in [1], para 6.3.7.5.3.
- 2.2.6.3.7.6 Optional MAC AAS support of OFDM and OFDMA**
- 2.2.6.3.7.6.1 AAS MAC services  
NA
- 2.2.6.3.7.6.2 MAC control functions  
NA
- 2.2.6.3.7.6.3 AAS DL synchronization  
NA
- 2.2.6.3.7.6.4 Alerting the BS about presence of a new SS in an AAS system  
NA
- 2.2.6.3.7.6.5 FDD/TDD support  
NA
- 2.2.6.3.7.6.6 Requesting bandwidth  
NA

**2.2.6.3.8 Contention resolution**

AeroMACS shall implement contention resolution as defined in [1], para 6.3.8.

**2.2.6.3.8.1 Transmission opportunities**

AeroMACS shall implement transmission opportunities as defined in [1], para 6.3.8.1.

**2.2.6.3.9 Network entry and initialization**

AeroMACS shall implement the network entry and initialization procedure as defined in [1], para 6.3.9.

**2.2.6.3.9.1 Scanning and synchronization to the DL**

AeroMACS shall implement scanning and synchronization to the DL as defined in [1], para 6.3.9.1.

**2.2.6.3.9.2 Obtain DL parameters**

AeroMACS shall implement obtain DL parameters as defined in [1], para 6.3.9.2.

**2.2.6.3.9.3 Obtain UL parameters**

AeroMACS shall implement obtain UL parameters as defined in [1], para 6.3.9.3.

**2.2.6.3.9.4 Message flows during scanning and UL parameter acquisition**

[INFORMATIVE]

**2.2.6.3.9.5 Initial ranging and automatic adjustments**

AeroMACS shall implement initial ranging and automatic adjustments as defined in [1], para 6.3.9.5.

**2.2.6.3.9.5.1 Contention-based initial ranging and automatic adjustments**

AeroMACS shall implement contention based initial ranging and automatic adjustments as defined in [1], para 6.3.9.5.1.

**2.2.6.3.9.6 Ranging parameter adjustment**

AeroMACS shall implement Ranging parameter adjustment as defined in [1], para 6.3.9.6.

**2.2.6.3.9.7 Negotiate basic capabilities**

AeroMACS shall implement Negotiate basic capabilities as defined in [1], para 6.3.9.7.

**2.2.6.3.9.8 SS authorization and key exchange**

AeroMACS shall implement SS authorization and key exchange as defined in [1], para 6.3.9.8.

**2.2.6.3.9.9 Registration**

AeroMACS shall implement the registration process, by which the MS is allowed into the network, as defined in [1], para 6.3.9.9.

**2.2.6.3.9.9.1 IP version negotiation**

Aero MACS shall implement IP version negotiation as defined in [4], para 7.2 or equivalent.

**NOTE:** AeroMACS uses transport connection identifier (TCID).

**2.2.6.3.9.10 Establishing IP connectivity**

AeroMACS shall implement Establishing IP connectivity as defined in [4], para 7.2 or equivalent.

**NOTE:** AeroMACS uses transport connection identifier (TCID).

**2.2.6.3.9.11 Establishing time of day**

NA

**2.2.6.3.9.12 Transferring operational parameters**

AeroMACS shall implement Transferring operational parameters as defined in [4], para 7.2 or equivalent.

**NOTE:** AeroMACS uses transport connection identifier (TCID).

**2.2.6.3.9.13 Establishing provisioned connections**

AeroMACS shall implement Establishing provisioned connections as defined in [4], para 7.2 or equivalent.

**NOTE:** AeroMACS uses transport connection identifier (TCID).

**2.2.6.3.9.14 Forcing MSs to perform network entry at once**

NA

**2.2.6.3.10 Ranging**

[INFORMATIVE]

**2.2.6.3.10.1 DL burst profile management**

NA

**2.2.6.3.10.2 UL periodic ranging**

NA.

**2.2.6.3.10.3 OFDMA-based ranging**

AeroMACS shall implement the OFDMA-based ranging procedure as defined in [1], para 6.3.10.3.

**2.2.6.3.10.3.1 Contention-based initial ranging and automatic adjustments**

AeroMACS shall implement contention-based initial ranging and automatic adjustments as defined in [1], para 6.3.10.3.1.

**2.2.6.3.10.3.2 Periodic ranging and automatic adjustments**

AeroMACS shall implement periodic ranging and automatic adjustments as defined in [1], para 6.3.10.3.2.

**2.2.6.3.10.4 CDMA HO ranging and automatic adjustment**

AeroMACS shall implement CDMA HO ranging as defined in [1], para 6.3.10.4.

**2.2.6.3.10.4.1 Dedicated ranging and automatic adjustments**

NA

**2.2.6.3.11 Update of channel descriptors**

AeroMACS shall implement updates of channel descriptors as defined in [1], para 6.3.11.

**2.2.6.3.12 Assigning SSs to multicast groups**

NA

**2.2.6.3.13 Establishment of multicast connections**

NA

**2.2.6.3.14 Quality of Service**

[INFORMATIVE]

**2.2.6.3.14.1 Theory of operation**

[INFORMATIVE]

**2.2.6.3.14.2 Service flows**

[INFORMATIVE]

**2.2.6.3.14.3 Object models**

[INFORMATIVE]

**2.2.6.3.14.4 Service classes**

[INFORMATIVE]

## 2.2.6.3.14.4.1 Global service classes

[INFORMATIVE]

**2.2.6.3.14.5 Authorization**

[INFORMATIVE]

**2.2.6.3.14.6 Types of service flows**

[INFORMATIVE]

## 2.2.6.3.14.6.1 Provisioned service flows

[INFORMATIVE]

## 2.2.6.3.14.6.2 Admitted service flows

[INFORMATIVE]

## 2.2.6.3.14.6.3 Active service flows

[INFORMATIVE]

**2.2.6.3.14.7 Service flow creation**

[INFORMATIVE]

## 2.2.6.3.14.7.1 Dynamic service flow creation

## 2.2.6.3.14.7.1.1 Dynamic service flow creation – SS-initiated

NA

## 2.2.6.3.14.7.1.2 Dynamic service flow creation – BS-initiated

AeroMACS shall implement BS-initiated dynamic service flow creation as defined in [1], para 6.3.14.7.1.2.

**2.2.6.3.14.8 Dynamic service flow modification and deletion**

[INFORMATIVE]

**2.2.6.3.14.9 Service flow management**

## 2.2.6.3.14.9.1 Overview

[INFORMATIVE]

## 2.2.6.3.14.9.2 Dynamic service flow state transitions

[INFORMATIVE]

## 2.2.6.3.14.9.3 Dynamic service addition (DSA)

## 2.2.6.3.14.9.3.1 SS-initiated DSA

NA

## 2.2.6.3.14.9.3.2 BS-initiated DSA

AeroMACS shall implement BS-initiated DSA as defined in [1], para 6.3.14.9.3.2.

## 2.2.6.3.14.9.3.3 DSA state transition diagrams

[INFORMATIVE]

## 2.2.6.3.14.9.4 Dynamic service change (DSC)

[INFORMATIVE]