



International Civil Aviation Organization

**EIGHTEENTH MEETING OF THE COMMUNICATIONS/NAVIGATION
AND SURVEILLANCE SUG-GROUP (CNS SG/18) OF APANPIRG**

Asia and Pacific Regional Sub-Office, Beijing, China
(21 – 25 July 2014)

Agenda Item 5: Aeronautical Mobile Service (AMS)

AEROMACS DEVELOPMENT STATUS UPDATE

(Presented by United States of America)

SUMMARY

This paper presents status of standards development and research as well as program activities ongoing to support future system implementation of the AeroMACS system.

1. INTRODUCTION

1.1 Background

1.1.1 The International Civil Aviation Organization's 11th Air Navigation Conference held in 2003 paved the way for the United States and Europe to work together to support future Air Traffic Service voice and data communications technology development. The Future Communications Study (FCS) was initiated as part of Action Plan 17 (AP17) of the joint FAA/EUROCONTROL Memorandum of Cooperation reflecting the cooperation between EUROCONTROL and the FAA to ensure future global harmonization and interoperability in Air Traffic Services.

1.1.2 The FCS focused on selecting appropriate technologies to support the future U.S. NextGen and European SESAR requirements. The study recommended specific technologies for terrestrial enroute, oceanic and remote, and airport surface communications. The study recommendations were endorsed by the FAA, EUROCONTROL and the ICAO Aeronautical Communications Panel (ACP). Included in the AP17 Final Report was the identification of an IEEE 802.16e based system, referred to as the Aeronautical Mobile Airport Communications System (AeroMACS) as the recommended solution for the provision of dedicated aeronautical communication services on the airport surface. The system will utilize as its core band Aeronautical Mobile (Route) Service (AM(R)S) C-band allocations achieved at the World Radiocommunication Conference in 2007. This paper provides the status of standards development and research as well as program activities ongoing to support future system implementation of the AeroMACS system.

1.2 Applications

1.2.1 AeroMACS is presently authorized to operate in the 5091 -5150 MHz aeronautical frequency band, with potential future expansion within portions of the 5000 to 5091 MHz frequency range. The 5 GHz band is suitable for airport surface wireless networks with short range of approx. 3 km coverage with high aggregate data throughput of up to 10s of Mb/s per channel. The AM(R)S designation provides protected spectrum for safety and regularity of flight applications. This 5091-5150 MHz allocation is limited to communications supporting surface applications at airport.

1.2.2 AeroMACS can potentially support a wide variety of air traffic services (ATS) and airline operational control (AOC) data, video and voice communications and information exchanges among users at the airport. The airport Communications, Navigation and Surveillance infrastructure that supports Air Traffic Management on the airport surface can benefit from a secure wireless communications system with improved availability and diversity. As a wideband communications network, it could enable sharing of graphical data and near real-time video to significantly increase situational awareness, improve surface movement to reduce congestion and delays and to help prevent runway incursions. AeroMACs can also provide temporary communication capabilities during construction or outages and reduce the cost of connectivity in comparison to underground cabling. Finally, a broadband wireless communications system like AeroMACS could enhance collaborative decision making, ease updating of large database-wide Information Management services by delivering time-critical advisory information to the cockpit.

1.2.3 The US interpretation¹ of the WRC-07 allocation allows for the inclusion of fixed airport assets supporting the services that directly impact safety and regularity of flight within the mobile wireless communications network. As such, AeroMACS may be designed to support communication, navigation and surveillance equipment that produces data used for control of aircraft and other vehicle movements on the surface.

2. DISCUSSION

2.1 Research Activities

2.1.1 In 2009 an AeroMACS prototype network was built and installed at the Cleveland Hopkins International Airport by the NASA Glenn Research Center to support research and standards development. The test bed includes two base stations (BSs) which provide overlapping coverage on the airport surface. The BSs are linked to core servers by microwave data backhaul radios. Eight fixed-location subscriber stations (SS) are used to evaluate fixed-link performance. The network includes Access Service Network – Gateway and core Connectivity Service Network functions to provide Quality of Service control, user authentication and authorization for security and mobility handover among multiple BTS sectors.

2.1.2 Testing performed involved fixed-performance experiments and a set of initial mobility tests. The tests explored the unique propagation conditions and the effects of proposed AeroMACS standards profile parameter settings. Data throughput and packet integrity were measured for a 5 MHz channel bandwidth; stationary and mobile SS, LOS and Non-LOS propagation link; and in the presence of adjacent channel activity. A series of mobility tests were specifically conducted to evaluate and compare the relative effectiveness of single and multiple antenna configurations for the mobile SS. These tests evaluated downlink traffic throughput rates using multiple antenna configurations.

¹ Precedent exists in the International Telecommunications Union that local area networks operating in a mobile service allocation are allowed to support both fixed and mobile applications.

2.2 Standards Development

2.2.1 Standard developments are underway to ensure global interoperability of AeroMACS. In 2009 RTCA Special Committee 223 was formed to initiate the development of airport surface wireless communications standards. The two principal products of this special committee are the AeroMACS Profile document which was delivered in December 2010, and a Minimum Operational Performance Standard (MOPS) document which was delivered in November 2013. Each of these documents was presented to the RTCA program management committee in December 2013 and has been approved. SC-223 worked collaboratively with EUROCAE WG 82 on the development of these documents to ensure compatibility and these documents have now also been approved by EUROCAE as well.

2.2.2 The ICAO Aeronautical Communications Panel (ACP) WG-S was directed to develop Standards and Recommended Practices (SARPS) for the AeroMACS System. The first meeting was held in March 2012. The group will develop and validate ICAO SARPS, technical manuals and associated documents for AeroMACS. Draft SARPs are complete and validation activities are scheduled to begin in July 2014. The SARPs are projected to be completed in Dec. 2014 to allow ICAO publication in Air Navigation Annex 10 in 2016.

2.3 FAA Development and Implementation Activities

2.3.1 The FAA's Airport Surface Surveillance Capability (ASSC) Program has recognized a near term need for a low cost communications system on the airport surface to support their multi-lateration capability on the airport surface. As a result, the Program Office has procured and implemented AeroMACS equipment at the first (San Francisco, California - SFO) of eight major airports with the option for an additional seven airports. The FAA has identified other fixed asset programs which could take advantage of a wireless communications system in the near to midterm timeframe including the Flexible Terminal Sensor Network (a system which consolidates all current surface observation systems (ASOS, RVR, LLWAS) onto a single data communication and data processing infrastructure), the Enhanced Low Visibility Operations (a low cost runway-end infrastructure program designed to increase NAS Capacity and access during low visibility conditions) and others (ASR-9 Radar, Airport Vehicle Tracking, Airborne Access to SWIM).

2.3.2 Finally, the FAA is developing an AeroMACS Acquisition Strategy paper. The paper will recommend the best approach for the FAA or Service Provider to move forward with the implementation and operation of the AeroMACS network. The paper was completed in June 2014.

3. CONCLUSION

3.1 The meeting is invited to note the information contained in this paper and discuss relevant matters, as appropriate.
