



- Agenda Item 4: Assessment of operational requirements to determine the implementation of improvements in communication, navigation and surveillance (CNS) capabilities for operations in route and terminal area**

EVOLUTION OF AERONAUTICAL MOBILE COMMUNICATION INFRASTRUCTURE

(Presented by Secretariat)

SUMMARY	
The purpose of this information paper is to present the evolution of aeronautical mobile communication infrastructure to accommodate new functions and to provide the adequate capacity and quality of services required to support evolving air traffic management (ATM) requirements within the framework of the global ATM operational.	
Referencias	
<ul style="list-style-type: none">• Global Air Navigation Plan;• Action Plan 17 Future Communications Study	
ICAO STRATEGIC OBJECTIVES:	<i>A – Safety; and B – Air Navigation Capacity and Efficiency</i>

1. Introduction

1.1 At AN-Conf/11 there was a strong request particularly from the airlines (represented by IATA) for international co-operation in order to achieve the stated objectives and goals in a harmonized and globally interoperable manner, particularly for air/ground communications.

1.2 In line with the AN-Conf/11 recommendations, EUROCONTROL and the U.S. Federal Aviation Administration (FAA) decided to establish a dedicated working arrangement (Action Plan 17 of the EUROCONTROL-FAA Memorandum of Cooperation) to progress this work in a consistent manner in Europe and the United States. AP17 has been very closely coordinated with ICAO Communication Panel (CP) as a means to achieve worldwide consensus and global harmonization.

1.3 Under this work was developed the Future Communication Infrastructure concept defining technologies to be used as new aeronautical mobile communications for the medium and long term.

2. Discussion

2.1 Within the Communications Panel (CP) of ICAO, a common understanding has been reached that a Future Communications Infrastructure (FCI) is required to support applications and services as foreseen within a modernized Air-Traffic Management (ATM) environment. ATM modernization is

currently performed in several large projects: SESAR (Single European Sky ATM Research) in Europe, NextGen (Next Generation Air Transportation System) in the US, CARATS (Collaborative Action for Renovation of Air Transport Systems) in Japan, Sirius in Brazil and others.

2.2 As shown in Figure 1, the FCI comprises a set of data link technologies integrated into a single communications network: LDACS (L-band Digital Aeronautical Communications System) for air/ground communications, a dedicated data link to be used at large airports (AeroMACS, Aeronautical Mobile Airport Communications System), a satellite component, and a direct air/air data link.

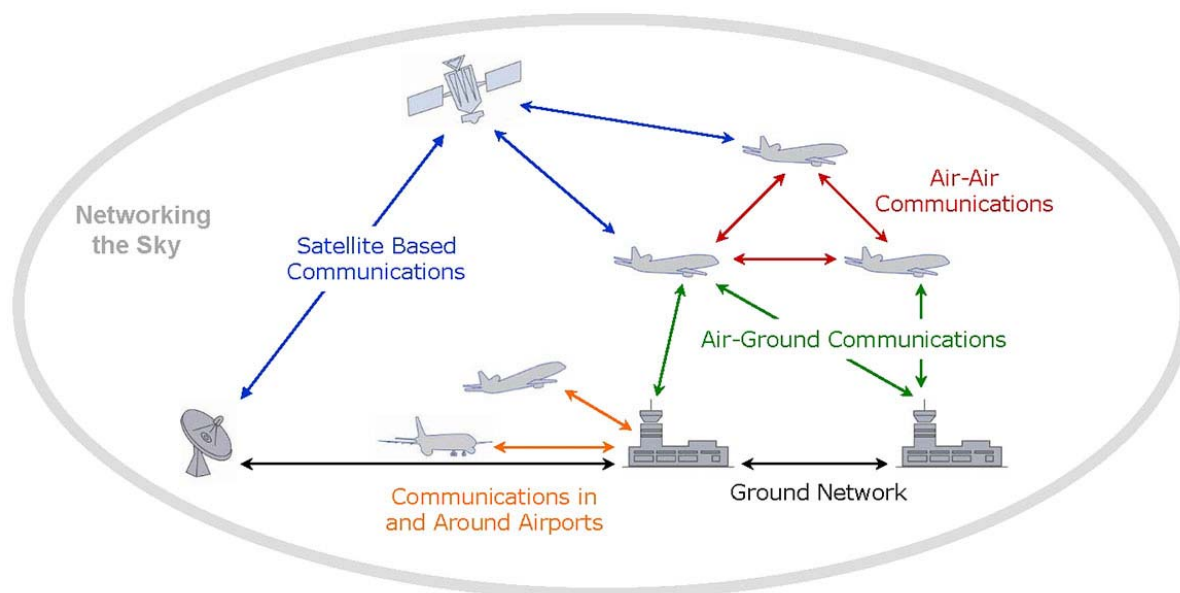


Figure 1 – The FCI comprising a set of data link technologies.

VDL Mode 2

2.3 The VHF Data Link (VDL) Mode 2 technology is currently introduced in Europe. This data link delivers connectivity with limited capacity. Most probably, VDL Mode 2 will not be capable to fully support modern ATM applications and services as required within SESAR, NextGen, and CARATS. Thus, air/ground communications need to be enhanced on a mid-term scope. A promising approach is to supplement VDL Mode 2 with the more performant LDACS data link.

L-band Digital Aeronautical Communications System

2.4 There are two LDACS candidates, LDACS1 and LDACS2. LDACS1 employs a broadband transmission using Orthogonal Frequency-Division Multiplexing (OFDM). A bandwidth of 500 kHz is used for both forward and reverse link by applying Frequency-Division Duplex (FDD). In addition, adaptive coding and modulation is applied. With that, LDACS1 follows modern and highly efficient transmission concepts as also used in, for example, the fourth generation of mobile radio systems. In contrast, LDACS2 follows a more conservative approach. It is based on Global System for Mobile Communications (GSM) *Aeronautical Mobile Airport Communications System*

2.5 AeroMACS (Aeronautical Mobile Airport Communication System) is an ICAO standardized data link system aiming to support the communication exchanges dealing with the safety and regularity of flight operations in the aerodrome (airport) environment.

2.6 AeroMACS is based on IEEE 802.16 [12] and is a modern (4th Generation, 4G) mobile wireless communication system providing broadband connectivity on the airport surface. AeroMACS can support the integration of the safety and regularity of flight communications of Aircraft Operators, Air Navigation Service Providers and Airports Authorities by providing high bandwidth and prioritized communication exchanges over a common infrastructure dedicated to critical communication exchanges in the airport environment.

2.7 AeroMACS systems can operate in the 5030 to 5150 MHz band under the ITU allocation for AM(R)S type of services (offering protection from interference from unauthorized users of the band).

Aeronautical Mobile Satellite Service

2.8 It has already been identified in ICAO Communication Panel that the current SATCOM (AMS(R)S) include relaxed delay requirements (20 and 30 seconds) which are not compatible with the performance requirements of the services required to support the SESAR and NextGEN concepts. Therefore, it is needed to update the current SATCOM SARPs to include more stringent performance requirements.

2.9 For this purpose, EUROCONTROL has established the NEXUS group to facilitate the development of a consensus proposal to ICAO for an update of the current AMS(R)S SARPS, while maintaining the compliance of the existing SATCOM systems. Therefore, NEXUS has agreed to structure the proposal to ICAO identifying 3 classes of performance requirements (Class A, B and C) for SATCOM systems as follows:

- 1) Class C will cover the performance requirements included in the current SARPs and will be applicable to systems already standardized in ICAO (such as INMARSAT Classic Aero/I3, MTSAT and Iridium). Class C is effectively covering oceanic operations.
- 2) Class B will cover more stringent (compared to Class C) performance requirements (such as the ones required by i4D) and will be applicable to existing but not currently standardized in ICAO SATCOM systems (such as INMARSAT SBB/I4 and Iridium Next) and which are expected to be considered for standardization in ICAO. Class B will cover oceanic and continental operations.
- 3) Class A will cover more stringent (compared to Class B) performance requirements (such as the one required by full 4D and the SESAR and NextGEN future concepts) and will be applicable to future SATCOM systems (not available today). Class A will cover oceanic and continental operations.

3. Suggested Action

3.1 The Meeting is invited to analyze the information provided in this information paper.
