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**Agenda Item 7 : Aeronautical air-ground and air-to-air communications**

# STATUS OF THE FAA'S NEXT GENERATION AIR/GROUND COMMUNICATIONS PROGRAMME

(Presented by United States)

**SUMMARY**

This paper provides the status of the FAA's development and acquisition of the Next Generation Air/Ground Communications (NEXCOM) programme. NEXCOM is the FAA's implementation of the 1995 ICAO Special Communications Operational Division Meeting recommendation for a time division multiple access solution for the future VHF air/ground communications technology.

## 1. INTRODUCTION

1.1 This paper provides the status of the Federal Aviation Administration (FAA) next generation air/ground communications (NEXCOM) programme. NEXCOM is the implementation of the ICAO very high frequency (VHF) air-ground integrated voice and data link system recommended by the 1995 ICAO Special Communications/Operations Divisional Meeting.

## 2. DISCUSSION

2.1 The FAA acquisition programme has been designed based upon the direction received during the following critical meetings and programme milestones:

a) April 1995: ICAO Special Communications/Operations Divisional Meeting;

b) September 1995: FAA approved a Mission Need Statement that served as the basis for the establishing of the next generation air/ground communications (NEXCOM) programme;

c) May 1998: FAA selected VHF digital link Mode 3 (VDL Mode 3) as the technology for NEXCOM;

d) 1999: ICAO/JCAB/Eurocontrol/UK/FRG/FAA complete VDL-3 SARPS validation; and

e) May 2000: FAA restructured NEXCOM acquisition plan as a result of significant airspace user input to the programme.

2.2 This last meeting, known as the NEXCOM Aviation Rulemaking Committee (NARC), was convened at the request of the administrator to gain direct input from the airspace user community on the future United States direction for aviation communications. The committee was comprised of members representing all segments of the aviation community. Anticipating a near-term spectrum depletion problem in the United States and considering the long-term implications of any air/ground communications system decision on all segments of aviation, the group reached consensus on five major recommendations. Those recommendations are summarized below:

a) report annually on VHF spectrum saturation status;

b) continue support for data link development;

c) expedite a system demonstration of a fully certified VDL-3 system;

d) develop an alternative plan if VDL-3 proves untimely; and

e) develop globally interoperable next generation communications system.

2.2.1 The FAA subsequently adopted these strategic recommendations and integrated them into its ongoing acquisition programme.

2.3 The FAA's NEXCOM programme, which implements these recommendations, is designed to meet several operational needs:

a) provide added spectrum capacity for both voice and data requirements within the assigned VHF air traffic control (ATC) band, in light of projected spectrum depletion;

b) replace and modernize the FAA's aging air/ground communication infrastructure;

c) provide a high-integrity data path suitable for air traffic control, that meets the needs of all NAS users; and

d) reduce air/ground communications interference and provide security and channel control features to identify unauthorized users.

2.3.1 The FAA selected VDL Mode 3 for NEXCOM based on its capability to fulfill these requirements, as well as provide safety/capacity enhancement voice channel features such as controller override and anti-blocking.

2.4 The first phase of the NEXCOM programme is the development of operational equipment for both ground and aircraft users. Final validation of the system-level requirements will be conducted from the perspective of the airborne users and operational organizations providing ATC service. This effort will result in appropriate, correct and complete requirements that form the basis of the subsequent full-scale production NEXCOM system. To achieve this first phase, the FAA's NEXCOM programme is organized into four main efforts:

***Multimode digital radio (MDR)***

2.4.1 The FAA has contracted with ITT for a multi-mode digital radio. These ground-based multi-mode radios will provide air/ground communications for all air traffic control facilities in the NAS. These radios are capable of VDL Mode 3, 25 kHz DSB-AM and 8.33 kHz DSB-AM operation. In concert with the NARC recommendations, all modes of operation are undergoing full test and evaluation as part of the acquisition. Currently MDRs are installed at a key site in Florida and final operational approvals are in progress. These radios will first be deployed to replace current air/ground radios and will initially operate in 25kHz analog mode. The MDR's will be fully capable of transitioning to VDL Mode 3 pending the success of the avionics and ground system development activities described below.

***Avionics development***

2.4.2 To assure interoperability, certification and commercial availability of the VDL Mode 3 capability, the FAA has initiated a cooperative avionics development effort. FAA has signed government-industry agreements (GIA) with three manufacturers to develop the multimode avionics that will incorporate VDL Mode 3. Rockwell Collins and Honeywell are developing avionics for the commercial air transport market, while Avidyne is developing panel-mounted VDL 3 radios for the General Aviation market. The FAA also has an agreement in process that will begin the development of avionics for the business jet and commuter market.

2.4.3 The commercial air transport avionics are upgrades of the ARINC 750 VHF Digital Radios currently in production. The FAA is working with the Airline Electronic Engineering Committee (AEEC) in the development of needed documentation leading to adoption of characteristics for these new avionics. All technical work has been completed and is under review by the VDL subcommittee of the AEEC. Once complete, these technical packages and subsequent characteristics will be available to all manufacturers for use in developing VDL Mode 3 capable equipment.

2.4.4 Additionally, to support the certification of these avionics, RTCA SC-172 has developed and approved the minimum operational performance standards (MOPS). The FAA's Certification Branch is currently developing technical standard orders based on the VDL Mode 3 MOPS and is working with avionics vendors and airlines to support the installation approval process required for full user operation.

2.4.5 The FAA and its industry partners are currently conducting interoperability testing between the pre-production avionics and the ground system test bed at the William J. Hughes Technical Centre. In

addition, selected units will be included in a NEXCOM system demonstration scheduled for November of 2003. These radios are to be certified and available for purchase beginning in 2005.

***Ground system segment***

2.4.6 To provide the ground half of the NEXCOM VDL 3 system, the FAA is in the process of developing the components necessary to enable provision of NEXCOM digital voice and data services. The NEXCOM ground system consists of two main components, the Radio Interface Unit (RIU), and the ground network interface (GNI). The present phase of this development effort, known as the rapid preliminary development effort (RPDE), consists of a competitive requirements analysis and preliminary design effort. It also includes an engineering development model that will demonstrate key FAA system requirements and the feasibility of each vendor's preliminary design. Contracts for RPDE have been awarded to two teams headed by Harris Corporation and ITT Corporation respectively. The system requirements review with each team has been completed.

2.4.7 Following the successful completion of the RPDE, the FAA will commence the full scale development (FSD) of the ground system. This effort is scheduled to begin in early 2005 and continue through 2007, concluding in an air traffic control keysite operational test and evaluation. Pending successful operational testing, full-scale system production and operational deployment will then begin, allowing for first implementation of a fully digital air/ground infrastructure in selected sectors by 2009.

***NEXCOM system demonstrations***

2.4.8 In concert with the NARC recommendations, the FAA is conducting a series of three end-to-end operational system demonstrations. The first demonstration, conducted in October 2002, included a highly successful demonstration of the viability of the VDL-3 technology. The second demonstration will highlight the operation of pre-production avionics in October/November 2003. Certificated avionics and developmental ground systems providing NEXCOM services in an operational ATC environment will be the focus of the final demonstration, scheduled for the end of 2004.

2.4.9 To provide adequate time for both the system development and validation activities described above, as well as longer lead times for avionics equipage, the FAA is aggressively managing the existing 25 kHz spectrum. The FAA is dedicated to preserving the 25 kHz integrity of the VHF band, as this will allow the greatest flexibility for introduction of future digital services. Once the NEXCOM system development work is completed, the FAA will have several options available to begin the transition of the national airspace system (NAS) to a fully digital infrastructure using VDL Mode 3. The final specific form of such an initial transition (en-route first, voice-only, data-only, voice and data simultaneously, broadcast or two-way services, etc.) is still being analyzed within the programme. The cost and benefits to all users is a significant factor in determining the outcome of these deliberations.

## 3. CONCLUSION

3.1 The FAA is pursuing the development, validation, test, and certification of VDL Mode 3 as the potential basis for future NAS VHF communications. Fielding of the MDR ground radio component will begin shortly. The avionics and ground system development efforts are on or ahead of schedule. The FAA is aggressively managing its 25 kHz spectrum to provide time for successful development and validation of the VDL-3 technology and provide significant lead-time for user equipage. The final system operational deployment decision and the specific form of any digital transition

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