SIGNAL-IN-SPACE MINIMUM AVIATION SYSTEM PERFORMANCE STANDARDS (MASPS) FOR ADVANCED VHF DIGITAL DATA COMMUNICATIONS INCLUDING COMPATIBILITY WITH DIGITAL VOICE TECHNIQUES

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"Requirements and Technical Concepts for Aviation"

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FOREWORD

This document was prepared by Special Committee 172 (SC-172). It was approved by RTCA Technical Management Committee on September 12, 1994.

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- analyzing and recommending solutions to the system technical issues that aviation faces as it continues to pursue increased safety, system capacity and efficiency;

- developing consensus on the application of pertinent technology to fulfill user and provider requirements, including development of minimum operational performance standards for electronic systems and equipment that support aviation, and

- assisting in developing the appropriate technical material upon which positions for the International Civil Aviation Organization and the International Telecommunication Union and other appropriate international organizations can be based.

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EXECUTIVE SUMMARY

The purpose of this document is to define Minimum Aviation System Performance Standards (MASPS) for the signal-in-space characteristics for an advanced VHF digital data communications radio, including compatibility with digital voice techniques. The MASPS is divided into three sections; an introduction, aviation user requirements, and technical characteristics.

The introductory section provides VHF communications system characteristics including aeronautical VHF communications frequencies utilized and spectrum congestion. Service rules as defined by the Federal Communications Commission (FCC) and the Federal Aviation Administration (FAA) are also provided. Principles of operation of the current VHF voice and data systems and the proposed future system are presented. General applications are divided into three categories; they are Air Traffic Services, Aeronautical Operational Control, and Aeronautical Administrative Communications. Current system interconnection, routing, integration considerations and deficiencies are highlighted.

The aviation user requirements section identifies the users of the systems and specific aircraft characteristics. The expected availability and integrity of the avionics are described. System interoperability and compatibility requirements are emphasized to assure coexistence with the present analog voice system.

The technical characteristics section describes the new system. Two modes of operation are defined: they are packet and circuit mode. Packet mode refers to the operation of the Carrier Sense Multiple Access (CSMA) scheme, a mode used by the VHF Digital Link (VDL). Circuit mode refers to the real time voice and the non-real time data link capability of the Time Division Multiple Access (TDMA) architecture. The circuit mode is less defined than the packet mode. However, the circuit mode definition is included to ensure capability using a common signal-in-space definition to incorporate digital voice and other system features, permitting real-time operation.

The signal-in-space may be used for either or both modes of operation provided implementation is in accordance with the packet and circuit mode characteristics described herein and with industry standards. The definition, description, and specification of both modes are expected to continue to evolve as the industry, the service providers, and the users further develop future system concepts and capabilities.

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1.0 INTRODUCTION

The purpose of this document is to provide RTCA Minimum Aviation System Performance Standards (MASPS) that define the signal-in-space characteristics for an advanced VHF digital data communications radio, including compatibility with digital voice techniques.

This document examines the VHF communications system characteristics and principles of operation for both VHF voice and data system elements. Aviation user requirements and system requirements are considered and technical characteristics are developed for airborne transceivers and for ground transmitters/receivers. Finally, considerations are examined with regard to accommodating existing systems while making a transition to a new improved VHF data link.

1.1 VHF Communications System Characteristics

1.1.1 Introduction

The characteristics of the present air/ground VHF communications system are contained in the FCC Rules (47 CFR Part 87), the International Civil Aviation Organization (ICAO) Standards and Recommended Practices (SARPS) (Annex 10, Volume I, Chapter 4 Paras. 4.5 - 4.7), RTCA Minimum Operational Performance Standards (MOPS) (RTCA/DO-186) and in ARINC Characteristic 716-7.

These documents set forth the minimum mandatory and desired operational performance standards for VHF air/ground communications systems.

This MASPS primarily addresses the Physical Layer (Layer) and the Media Access Control (MAC) lower sublayer of Layer 2 of the Open System Interconnection (OSI) model aside from the possible exception of error detection. However, it is recognized that this MASPS does not include the full definition of signal-in-space standards, as understood by ICAO and will require further work. This work is expected to be completed in the parallel efforts to complete the ICAO SARPS in the Aeronautical Mobile Communications Panel (AMCP) and in the development of MOPS within RTCA SC-172, WG3.

1.1.2 Definitions of Terms

Please note that these terms and definitions are to be used for the purposes of this MASPS.

Aeronautical Mobile (Route) Service (AM(R)S): An aeronautical mobile service reserved for communications relating to safety and regularity of flight, primarily along national or international air routes.

Aeronautical Mobile Service: A mobile service between aeronautical stations and aircraft stations, or between aircraft stations, in which survival craft stations may participate; emergency locator transmitter (ELT) stations may also participate in this service on designated distress and emergency frequencies.

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