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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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Prepared by SC-214

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FOREWORD

This document was prepared by Special Committee 214 (SC-214) and approved by the RTCA Program Management Committee (PMC) on December 13, 2011. Previous versions of the document were prepared by Special Committee 172 (SC-172).

RTCA, Incorporated is a not-for-profit corporation formed to advance the art and science of aviation and aviation electronic systems for the benefit of the public. The organization functions as a Federal Advisory Committee and develops consensus-based recommendations on contemporary aviation issues. RTCA's objectives include but are not limited to:

- Coalescing aviation system user and provider technical requirements in a manner that helps government and industry meet their mutual objectives and responsibilities;
- 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.

The organization's recommendations are often used as a basis for government and private sector decisions as well as the foundation for many Federal Aviation Administration Technical Standard Orders.

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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 advanced Very High Frequency (VHF) digital data communications, including compatibility with digital voice techniques. The MASPS document 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 its implications to 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 (ATS) communications, Aeronautical Operational Communications (AOC) and Aeronautical Administrative Communications (AAC). 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: VDL Mode 2 and VDL Mode 3. VDL Mode 2 refers to the operation of the Carrier Sense Multiple Access (CSMA) Media Access Control (MAC) protocol to support data link compatibility. VDL Mode 3 refers to the functionally simultaneous voice and data link capability of the Time Division Multiple Access (TDMA) MAC protocol.

The signal-in-space may be used for either or both modes of operation provided implementation is in accordance with the VDL Mode 2 and VDL Mode 3 characteristics described herein and with other relevant 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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TABLE OF CONTENTS

APPENDICES

TABLE OF FIGURES

TABLE OF TABLES

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 advanced Very High Frequency (VHF) digital data communications, 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 aircraft transceivers and 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 Federal Communications Commission (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), and RTCA/DO-186B *Minimum Operational Performance Standards for Airborne Radio Communications Equipment*. These documents set forth the minimum mandatory and desired operational performance standards for VHF air/ground communications systems. The following list summarizes pertinent industry standards and their specific versions.

Reference Document Name	**Doc. #**
ARINC Specification – Air-Ground Character-Oriented Protocol Specification	618
ARINC Specification – ACARS Protocols for Avionic End Systems	619
ARINC Specification – Data Link Ground System Standard and Interface Specification (DGSS/IS)	620
ARINC Specification – ATS Data Link Applications Over ACARS Air-Ground Network	622
ARINC Specification – Character-Oriented Air Traffic Services (ATS) Applications	623
ARINC Specification – VHF Digital Link (VDL) Mode 2 Implementation Provisions	631
ARINC Characteristic – Aircraft Communications Addressing and Reporting System (ACARS)	597
ARINC Characteristic – Enhanced ACARS Avionics	597A
ARINC Characteristic – Airborne VHF Communications Transceiver	716
ARINC Characteristic – VHF Data Radio	750
ARINC Characteristic – Communications Management Unit (CMU) Mark 2	758
ICAO Document - Manual of Technical Provisions for the Aeronautical Telecommunication Network	9880
ICAO Document - Comprehensive Aeronautical Telecommunication Network Manual	9739