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Design Guidelines and Recommended Standards for the Implementation and Use of AMS(R)S Voice Services in a Data Link Environment

RTCA DO-231
March 13, 1996

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Foreword

This report was prepared by Special Committee (SC-165) and approved by the RTCA Technical Management Committee (TMC) on March 13, 1996.

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:

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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.

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

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Preface

This document embodies a consensus representative of the insight of those who are concerned with the integration of an evolving communications tool, i.e., satellite voice communications, into a future data link environment also in its early stages of evolution. As a consequence of the early evolutionary state of voice communication services in general as they apply to a data link oriented environment, it was not possible for SC-165 to define firm requirements for the implementation and use of satellite voice. Therefore, this document, as indicated by its title, contains *guidelines* and *recommendations* rather than actual requirements. However, those responsible for this document felt it important for the reader to be aware of the relative degrees of importance attached to the various recommendations contained herein. To that end this document has been written using the traditional language of a *requirements* document. However, the reader should regard its contents as recommendations upon which subsequent standards can be based. The development of such standards, including a MASPS for the end-to-end satellite voice service and a MOPS for a new data link end-system application to support satellite voice operation, is envisioned to commence within SC-165 in early 1996.

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1.0 Introduction

1.1 Purpose and Scope

This document contains functional and interface requirements for the implementation and use of Aeronautical Mobile Satellite Service (AMSS) voice communications in an environment where satellite voice is a required capability. The information contained herein describes satellite voice services in the Air Traffic Management (ATM) and Aeronautical Operational Control (AOC) environments -- including requirements for aircraft installations, satellite services, ground interconnection facilities, and Air Traffic Service facility capabilities. The scope of this document is focused primarily on the use of satellite voice in Oceanic and Remote airspace areas. However, there may be use of satellite voice in Domestic Enroute airspace; and its use in low-density Terminal airspace might prove useful in certain situations.

The objective of this document is to facilitate the certification and use of satellite voice communication systems as a required capability. Inherent in this capability is the notion that all satellite voice communications, both air- and ground-originated, will be accomplished with automatic call processing on an end-to-end basis so as to provide rapid, direct communication between the air and ground user

Compliance with these requirements is a means of assuring that the AMSS voice service will perform its intended functions at an expected performance level. Any regulatory application of this document is the sole responsibility of the appropriate authority.

NOTE:

1. *This document takes a long-term perspective of the end-to-end satellite voice service, circa 1996 and beyond. It defines the end-to-end system characteristics needed to facilitate the development, implementation, certification, and operational use of satellite voice in an environment where satellite voice communication is a required capability. The primary orientation of this document focuses on the use of satellite voice services in a CNS/ATM environment where the primary means of ATS communication is via data link. However, provisions are also made for environments where data-link services are either less than fully implemented or are unavailable due to an outage.*

2. *The standards contained in this document do not presuppose a specific data network standard such as the Aeronautical*

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Telecommunications Network (ATN) or character-oriented networks using Arinc Characteristic 622.

Associated with this document are the following companion documents:

a. "*AMSS Minimum Operational Performance Standards*," (MOPS) RTCA Document No. DO-210C, which establishes a certification basis for the installation on aircraft of AMSS equipment;

b. "*Guidance on AMSS End-to-End System Performance and Verification*," RTCA Document No. DO-215A, which prescribes guidance on the performance aspects of interconnected systems comprising an end-to-end AMSS service; and

c. "*Guidelines on AMS(R)S Near-Term Voice Implementation and Utilization*," RTCA Document No. DO-222, which contains guidelines for the initial implementation and use of satellite voice in the circa 1993-95 ATS environment. This document includes a considerable amount of tutorial information and it should be referenced in parallel with this document.

d. *"Minimum Operational Performance Standards for ATC Two-Way Data Link Communications,"* RTCA Document No. DO-219, which establishes a certification basis for Two-Way Data Link (TWDL) communications services for ATC communications.

1.2 Document Organization

Section 1 of this document contains an overview of the end-to-end satellite voice system architecture, a description of the architecture's component subnetworks, a description of the projected operational environment, and the goals and assumptions used in the formulation of the requirements. Definitions of key terminology essential to a proper understanding of this document are also included in this Section.

Section 2 contains the minimum functional standards for each of the subnetworks and end-user functional areas comprising the end-to-end satellite voice system. Addressed separately are the aircraft end-user functional area; the satellite, terrestrial, and in-facility subnetworks; and the ground end-user functional area.

Section 3 contains a description of the nominal performance which can be expected of an operating end-to-end satellite voice service. The Section includes the available

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performance for ground and airborne installed equipment; and for the various subnetworks of the end-to-end service.

Section 4 contains the monitoring and performance verification requirements for an operational satellite voice service as described by this document.

Appendix A provides explanation of key terms and acronyms in a Glossary.

Appendix B provides a brief tutorial on the Interworking Telephony Event nomenclature used throughout this document to define the telephone signaling interfaces between tandem voice networks.

Appendix C is a normative appendix containing detailed requirements for the telephony signaling actions required at various interfaces between telephony subnetworks and the functional areas.

Appendix D is a normative appendix containing detailed requirements for the management interface actions required between the Facility Subnetwork and various functions within an ATS Facility.

Appendix E provides information on instances where a flight deck voice call might be interrupted or blocked and makes recommendations on ways to eliminate these possibilities.

1.3 Background

1.3.1 Basis for Satellite Voice Services

The original FANS committee performed a comprehensive assessment and analysis of the characteristics and capabilities of the high frequency (HF) voice radio service as used for ATS communications, as well as the status of its implementation in various parts of the world. The examination confirmed that three essential factors limited the use and expansion of current CNS systems to meet civil aviation's growing requirements for the future decades:

a. The propagation restrictions of existing radio communication systems and/or the accuracy and reliability constraints caused by variability of the propagation characteristics of various radio navigation systems;

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