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Minimum Aviation System Performance Standards (MASPS) for Flight Information Services-Broadcast (FIS-B) Data Link

Revision A

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FOREWORD

The original report (DO-267) was prepared by Special Committee 195 (SC-195) and approved by the RTCA Program Management Committee (PMC) on March 27, 2001. Revision A of DO-267 was prepared by SC-195 and approved by the PMC on April 29, 2004. Appendices D, F and I are normative appendices.

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

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

c. 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

d. 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

This document contains Minimum Aviation System Performance Standards (MASPS) for Flight Information Services-Broadcast (FIS-B), an automated, digital data link system. The FIS-B system will provide timely access to data link updates of non-control, advisory information needed by pilots to operate safely and efficiently in the National Airspace System and in international airspace.

The format of this document generally follows that of an RTCA Minimum Operational Performance Specification (MOPS). However, a traditional MOPS is not appropriate for FIS-B since this document establishes system performance rather than requirements for specific equipment. This MASPS supports interoperability between providers of ground and airborne FIS processing systems by defining a broadcast protocol that may be used in any broadcast medium (i.e., VHF, satellite). The MASPS also provides design guidelines and recommended standards for airborne processing and display of FIS products.

The FIS-B broadcast network organization described in the MASPS consists of a physical layer, an International Standards Organization (ISO) standard-based Data Link Services (DLS) layer, a Network layer, an FIS-B Application Service Element (ASE), and an FIS-B Application. The physical layer is supplied by the manufacture with all the other layers and/or elements defined in the MASPS.

The FIS-B Application Service Element (ASE), noted above, provides connectionless unacknowledged protocol services to include support for the segmentation (and reassembly) of large data files into Application Protocol Data Units (APDUs). Segmenting large application data files into smaller APDUs reduces the amount of data lost due to any data link impairments. The MASPS also establishes a publicly accessible FIS-B Product Registry that facilitates coordination and publication of specifications for APDU Payload encoding of new FIS products.

The MASPS guidance for airborne processing and display of FIS products is applicable to any display of FIS information in the flight deck (or cockpit). It is anticipated that most avionics that process and display FIS products will be approved using existing type certification or supplemental type certification processes such as TSO C113, Airborne Multipurpose Electronic Displays. Consequently, this document only contains guidance that is unique to FIS-B and independent of other functions that are governed by other directives such as terrain and obstacles, and traffic.

As the National Airspace System (NAS) evolves and the concepts of Free Flight are implemented, the requirement for use of FIS products and services may change from being advisory in nature to being required for safety of flight. Any such required use will require a revised definition of the operating environment outlined in this MASPS to include the associated application of Required Communications Performance (RCP) criteria. The introduction of such RCP criteria will require changes to this MASPS, especially to Section 2.0, System Performance Specifications, and Section 4.0, Procedures for Performance Requirement Verification.

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1 PURPOSE AND SCOPE

1.1 Introduction

This document contains Minimum Aviation System Performance Standards (MASPS) for Flight Information Services-Broadcast (FIS-B), an automated, digital data link system. The FIS-B system will provide timely access to data link updates of non-control, advisory information needed by pilots to operate safely and efficiently in the National Airspace System and in international airspace. FIS-B services will provide FIS information to pilots such as weather graphics and text, Special Use Airspace (SUA) information, and Notices to Airmen (NOTAMs). This document provides a broadcast protocol for use in any broadcast medium.

These specific system performance standards and equipment characteristics should be useful to designers, manufacturers, installers, and users of FIS-B data link systems. Functional specifications are used where possible so that implementers may have flexibility in developing FIS-B data link systems. Designing to these standards is one means of assuring that the system and equipment will perform their intended functions satisfactorily under all conditions normally encountered in routine aeronautical operations. Any regulatory application of this document is the sole responsibility of appropriate governmental agencies.

The format of this document generally follows that of an RTCA Minimum Operational Performance Specification (MOPS). However, a traditional MOPS is not appropriate for FIS-B, since this document establishes system performance rather than requirements for specific equipment. This MASPS defines a broadcast protocol that supports interoperability between providers of ground and airborne FIS processing systems and provides design guidelines and recommended standards for airborne processing and display of FIS products.

Section 1 of this document provides information on purpose and scope needed to understand the rationale for system and equipment characteristics, standards, and performance requirements stated in the remaining sections. It describes typical system applications and operational goals, and establishes the basis for the standards and performance requirements stated in Sections 1 and3, and Appendices D and F.

Section 2 contains the minimum system performance standards for FIS-B data link systems.

Section 3 contains the minimum performance standards for each subsystem/function that is a required element of the minimum system performance in Section 1. Section 3.1 defines the FIS-B network interface and Section 3.8 provides guidelines and recommended standards for airborne processing and display of FIS products.

Section 4 describes a set of minimum system test procedures to verify system performance compliance (e.g., end-to-end performance verification) and that subsystem performance meets the minimum performance requirements in Sections 1 and 3, and normative Appendices D, F and I.

Appendix A contains a list of acronyms and abbreviations.

Appendix B contains a glossary of terms.

Appendix C contains a list of references.

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Appendix D is a normative appendix that describes the format for the Application Protocol Data Unit (APDU).

Appendix E describes the FIS-B Product Registry, a publicly accessible source for listing the Product Identifiers contained in an APDU Header (see Appendix D) along with the specifications for encoding the FIS-B Product Files contained in the Payload portion of the APDU.

Appendix F is a normative appendix that describes exceptions to the FIS-B Interface as specified in Section 3.0.

Appendix G describes the test data sets used to verify FIS-B system performance as specified in Section 4.0.

Appendix H provides supporting background on ground-based and airborne weather radar systems that was used in determining the recommended color presentations for display of FIS precipitation products in the cockpit as listed in Table 3-2.

Appendix I is a normative appendix that provides supporting background on general design considerations for cockpit displays of layered graphics and text; and was used in determining the recommended guidelines for the integrated display formats as outlined in Section 3.8.3.

Appendix J provides supporting background on the National Convective Weather Forecast (NCWF) that was used in determining the recommended color presentations for the display of NCWF products in the cockpit as listed in Table 3-2.

Appendix K contains the binary coding for the 6-bit Data Link Applications Coding (DLAC) alphabet described in Section 3.8.1.6.

The word “subsystem” as used in this document includes all components that make up a major independent, necessary and essential functional part of the system so that the system can properly perform its intended function(s).

1.2 System Overview

An operational FIS-B system architecture includes the five processes or functions illustrated in Figure 1-1. These are:

1. collection of FIS source information from various sources;
2. processing and formatting the data where appropriate into FIS-B products;
3. processing (and segmenting) FIS-B products into APDUs for data link transmission;
4. broadcasting the digitally-coded data into coverage volumes in the airspace; and
5. receiving, decoding and displaying the data by avionics onboard the aircraft for the pilot’s review or other applications.

Figure 1-1 illustrates the FIS-B architecture from a protocol stack view. Both the hardware/processing view and protocol stack views are intended to be notional, that is, they do not place requirements on specific ground or avionics implementations. For

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