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Safety and Performance Requirements (SPR)
for
Aeronautical Information Services (AIS)
and
Meteorological (MET) Data Link Services

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FOREWORD

This document was prepared in joint session as part of RTCA Special Committee 206 (SC-206) and EUROCAE Working Group 76 (WG-76). It was approved by the RTCA Program Management Committee (PMC) on December 8, 2010.

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- 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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PREFACE

This document specifies minimal baseline operational, safety and performance requirements for the data link delivery of AIS and MET information as the primary means of communications between the air and the ground. The aim of the AIS and MET data link services is to provide aeronautical and meteorological information for flight efficiency and/or hazard avoidance in all flight environments.

Key components of Next Generation Air Transportation System (NextGen) and Single European Sky Air Traffic Management Research (SESAR) ATM future concepts are data sharing and collaborative decision making (CDM). In NextGen and SESAR, the traditional product-centric provision of aeronautical and weather information will be replaced by data-centric and service-oriented architecture systems. Providing timely (and continuous) updates of data-centric information will facilitate the creation of a common picture of the airspace situation for all involved in the planning and execution of flights (e.g. pilots, controllers, dispatchers). It is expected there will be an increased need for information on the flight deck that can be integrated into flight decision support tools and/or visualized on systems such as the Navigation Display or Electronic Flight Bags.

Achieving the goal of AIS and MET data link services will be evolutionary. The feasibility of providing timely updates from dynamic digital AIS and MET data has already been partly demonstrated through projects like the European and US Digital NOTAM systems, the developing SESAR and NextGen Four Dimensional Weather Cube and by the Digital Aeronautical Information Management (D-AIM) project conducted by LFV (Luftfartsverket) Sweden and EUROCONTROL.

This document is based on the joint RTCA DO-308/EUROCAE ED-151 document, "Operational Services and Environment Definition (OSED) for Aeronautical Information Services (AIS) and Meteorological (MET) data link services." It was developed jointly by RTCA Special Committee 206 and EUROCAE Working Group 76 and follows the criteria for SPR documents set forth in RTCA DO-264/EUROCAE ED-78A, "Guidelines for Approval of the Provision and Use of Air Traffic Services Supported by Data Communications." In addition to the qualitative safety assessment methodology in RTCA DO-264/EUROCAE ED-78A, a quantitative safety assessment has been performed to meet the requirements of the EUROCONTROL Safety Regulatory Requirement ESARR 4, "Risk Assessment and Mitigation in ATM". The Operational Performance Analysis and resulting performance requirements were determined through the application of the Required Communications Performance (RCP) approach and a comparison with other services within the DFIS application.

Four AIS/MET data link services are covered in this SPR: an aeronautical update service that provides current updates of aeronautical information; and three weather decision services that provide current updates of meteorological information designed to support flight crew decisions in three time categories (planning, near term and immediate decisions). While the data elements and the intended uses of the AIS and MET data differ, there are many common features related to the operating methods for the AIS and MET data link services. The common and specific features of the four AIS/MET data link services are described in Section 4. A summary of the SPR requirements and recommendations is provided in Section 5.

This document is based on a notional architecture and is not intended for implementation and operational use until validation activities are completed. It provides a framework and a methodology to be used as the basis for assessing implementation of new data link systems or architectures as candidates for AIS and/or MET data link services.

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1 INTRODUCTION

Note:

This document has been developed to support user and provider validation activities associated with the data communications needs of future Air Traffic Management concepts e.g, Next Generation Air Transportation System (NextGen) and Single European Sky Air Traffic Management Research (SESAR) initiatives. A key component of NextGen and SESAR ATM future concepts is data sharing and collaborative decision making (CDM). The traditional product-centric provision of aeronautical and weather information will be replaced by data-centric and service-oriented architecture systems. Providing timely (and continuous) updates of data-centric information will facilitate the creation of a common picture of the airspace situation for all involved in the planning and execution of flights (e.g. pilots, controllers, dispatchers). It is expected there will be an increased need for information on the flight deck that can be integrated into flight decision support tools and/or visualized on displays such as the Navigation Display or Electronic Flight Bags (EFB).

This document specifies safety and performance requirements for the data link delivery of AIS and MET information that is the primary means of communications between the air and the ground. The application of the AIS and MET information supports tactical as well as strategic decisions. The safety and performance analyses in this specification assume that voice is the secondary means of communication and is one of many mitigation means for failures of the data link service.

This document is based on a notional data link architecture. It is NOT intended for implementation and operational use until validation activities are completed based on candidate implementation data communications architectures. The methodology in this document can be used to support the intermediate application of AIS and MET data link services subject to revalidation of the assumptions and the environments described herein.

This document establishes the baseline operational, Safety, and Performance Requirements (SPR) for the implementation of Aeronautical Information Services (AIS) and Meteorological (MET) data link services as described in the joint RTCA DO-308 / EUROCAE ED-151 document, "Operational Services and Environment Definition (OSED) for Aeronautical Information Services (AIS) and Meteorological (MET) data link services" [Ref. 1.]. In this document focus is on the uplink of AIS (Aeronautical Updates) and MET data in managed continental airspace (Environment Description 1 – ED1) and unmanaged airspace (Environment Description 2 – ED2) as described in Section 3. The other AIS/MET data link services described in the OSED are deferred for consideration by appropriate committees; specifically the baseline synchronization of aircraft AIS databases by data link as well as the downlink and crosslink of MET data.

This document establishes the requirements for providing timely updates of AIS and MET information from dynamic digital data . That dynamic data could be in the form of full featured product delivery, in the form of composable data elements, or any combination depending on the individual architecture employed. The feasibility of such an approach has already been partly demonstrated through projects like the European and US Digital NOTAM systems, the developing SESAR and NextGen Four Dimensional Weather Cube and by the Digital Aeronautical Information Management (D-AIM) project conducted by LFV (Luftfartsverket) Sweden and EUROCONTROL.

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This document was developed jointly by RTCA Special Committee 206 and EUROCAE Working Group 76 and is based on the criteria for SPR documents set forth in RTCA DO-264/EUROCAE ED-78A, "Guidelines for Approval of the Provision and Use of Air Traffic Services Supported by Data Communications" [Ref. 2.]. In addition to the qualitative safety assessment methodology in RTCA DO-264/EUROCAE ED-78A, a quantitative safety assessment has been performed to meet the requirements of the EUROCONTROL Safety Regulatory Requirement ESARR 4, "Risk Assessment and Mitigation in ATM" [Ref. 3.]. The provisions of FAA Safety Requirements Risk Management Guidance on System Acquisition (SRMGSA), Version 1.4 [Ref. 6.], were also considered as appropriate.

The format and approach of this document follow the Data Communications Safety and Performance Requirements (SPR), Version H, being developed concurrently by the joint RTCA Special Committee 214 and EUROCAE Working Group 78. The Data Communications SPR addresses implementation of Air Traffic Services (ATS) data link communications and includes several AIS and MET text products in its data link Flight Information Services (DFIS) Applications. In contrast, this document focuses on the transfer of valid AIS or MET data in digital form from approved[1] ground-based AIS or MET data sources to support automated processing and/or graphic as well as text display.

This document provides the minimum baseline AIS and MET data link services requirements - and example allocations thereof - based on a notional architecture and the results of a coordinated requirements determination process for the first two phases of the data communications evolution through the NextGen Mid Term implementation, and the corresponding SESAR Implementation Package 2 (IP2) (circa 2018). The notional system described here includes ground and airborne elements as illustrated in Figure 1-1. These elements include the aircraft onboard transceiver and data link processing system(s), the ground transceiver and data link processing system(s) as well as the AIS/MET and Flight Plan (or Trajectory) data source(s). The AIS/MET data link services may be provided by State organization(s) or approved commercial vendor(s) - including an Air Navigation Service Provider (ANSP). The ground-air-ground communications services may be provided by a State or an approved commercial provider (Communication Service Provider or ANSP as well).

For ED1, detailed safety analyses of both AIS and MET applications were conducted using selected operational scenarios. Given the notional architecture, the performance requirements were determined through a comparative survey analysis of existing data communications performance requirements. For ED2, the analysis was conducted by comparison with ED1, based on the differences in CNS/ATM capabilities between the two environments.

1.1 Purpose

The aim of AIS and MET data link services is to provide aeronautical and meteorological information for flight efficiency and/or hazard avoidance in all flight environments. This information provides a common operating picture between the aircraft and the ground. It is intended to meet operational and regulatory requirements for flight crew decision

[1] In the whole document, the expression "approved source" should be understood as "a data source that has been officially recognized by the relevant State authority"

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support (i.e. enabling informed flight crew participation in CDM) and other actors on the ground who will be enabled, through a concept like SWIM to share the same information.

This document defines and allocates the set of baseline minima for the operational, safety, and performance requirements for implementation of AIS and MET Data Link services. These requirements are based on the data link delivery being the primary means of communication between the air and the ground, and the application of the AIS and/or MET information supporting tactical as well as strategic decisions. Voice is considered the secondary means of communications.

This document provides a framework and a methodology to be used as the basis for assessing implementation of new data link systems or architectures as candidates for AIS and/or MET data link services. It can also be used to support the processes that are required to enable Air Traffic Services (ATS) provider operational approval for the AIS/MET data link services.

1.2 Scope

This document supports the provision of AIS and MET data link services as components of the Data Link Flight Information Services (DFIS) application as defined in ICAO Doc 9694, Manual of Air Traffic Services Data Link Applications [Ref. 7.]. The AIS/MET data link services are intended to be provided to airspace users in various airspace environments, i.e. managed continental airspace (ED1) and unmanaged airspace (ED2), see Section 3.

The operational concept describes the delivery of digital AIS/MET data to aircraft within the area of responsibility of the AIS/MET Data Link Service Provider (DLSP). For the provision of its service(s), the DLSP relies on data / information from approved sources(s)[2] and on the most suitable data link communications means between the ground and the aircraft from Communications Service Provider(s). The service provision is independent of the air traffic control service and may be provided by State as well as commercial providers.

The operational concept assumes that the AIS/MET data will be the same as used by air traffic control. This will, in particular, ensure consistent information is shared by the various users participating in air traffic management (ATM). A typical application example is CDM.

The AIS/MET data source(s) are considered outside the scope of this SPR document and the data they provide are assumed correct. In addition, sources providing other data types (e.g. Flight Plan) necessary for an efficient implementation of the AIS/MET data link services are also outside the scope and their data are assumed correct. This SPR, notably in its Safety analysis, only considers errors in the AIS/MET data that are introduced by the data link system components. On the aircraft side, the flight crew interaction as well as the end use of the information performed by cockpit avionics (i.e. Flight Management System or display system) were considered in the analyses but are outside the scope of this SPR.

[2] In the whole document, the expression “approved source” should be understood as “a data source that has been officially recognized by the relevant State authority.”

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This document provides Safety and Performance Requirements for the following AIS/MET data link services based on the service descriptions provided in the OSED [Ref. 1.] and outlined in this document:

a. AIS service:

   - Data Link Aeronautical Update Service (D-AUS); Section 4.2

b. MET services :

   - Data Link Weather Planning Decision Service (D-WPDS); Section 4.3
   - Data Link Weather Near-Term Decision Service (D-WNDS); Section 4.4
   - Data Link Weather Immediate Decision Service (D-WIDS); Section 4.5

Note: The OSED includes two additional AIS/MET Data Link services: the AIS Baseline Synchronization Service (Complete Synchronization and Update Synchronization) and the MET Weather Downlink / Crosslink Service. The basic concepts for these services are sound but the safety and performance analyses for these services have been deferred until a clear need is identified and candidate architecture(s) for implementation defined. Development of the corresponding SPR will then have to be considered by appropriate committees / working groups.

Figure 1-1 presents a notional architecture of the system considered during the development of this SPR. This notional architecture illustrates a four component system used to support the safety and performance analyses and does not preclude the implementation of a different architecture.

The four components considered for the development of this SPR are:

- Ground Data Link Processing (GDLP);
- Ground Transceiver (GDLP/tr);
- Onboard Data Link Processing (ODLP);
- Onboard Transceiver (ODLP/tr).

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