RTCA, Inc.
1150 18th Street NW, Suite 910
Washington, DC 20036
USA

Concept of Use (CONUSE) for Aeronautical Information Services (AIS) and Meteorological (MET) Data Link Services

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Telephone: 202-833-9339
Facsimile: 202-833-9434
Internet: www.rtca.org

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FOREWORD

This report was prepared by Special Committee 206 (SC-206) and approved by the RTCA Program Management Committee on September 26, 2012.

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 the basis for government and private sector decisions as well as the foundation for many Federal Aviation Administration Technical Standard Orders and several advisory circulars.

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EXECUTIVE SUMMARY

The value and need for flight crew and cockpit access to timely updates of Aeronautical Information Services (AIS) and Meteorological (MET) information are well known, and established in current International Civil Aviation Organization (ICAO) air traffic procedures. The technologies for providing such updates, however, are rapidly moving from voice to data communications. This transition to data communications is a key component of the ICAO global Air Traffic Management (ATM) concepts and the supporting ICAO, U.S. Next Generation Air Transportation System (NextGen), and European Single European Sky ATM Research (SESAR) programs. In addition, new requirements for AIS and MET services are being generated based on these ICAO, NextGen, and SESAR initiatives.

An early assessment of the operational uses and benefits of AIS and MET data link services was documented in RTCA DO-232 (*Operational Concepts for Data Link Applications of Flight Information Services*). More recently, the joint RTCA DO-308/EUROCAE ED-151 (*Operational Services and Environment Definition for Aeronautical Information Services and Meteorological Data Link Services*) defined specific AIS and MET data link services. RTCA DO-324/EUROCAE ED-175 (*Safety and Performance Requirements (SPR) for AIS and MET Data Link Services*) was then published based on a notional architecture. It provides a framework and methodology for assessing implementation of candidate architectures; it is not intended for implementation and operational use until validation activities are completed.

This Concept of Use (ConUse) builds on the past work and provides an aviation industry view on how such AIS and MET data link services would be used to support flight operations. In this ConUse (Section 1.3), the data link services are considered as either the primary (Category 1) or useful (Category 2) means for communicating AIS and MET information, and voice becomes a secondary means for such communications. The operating environment and governing rules will determine when use of such AIS and MET data link services are appropriate. Also, implementation of such services will be evolutionary beginning with expected widespread use of useful (Category 2) AIS and MET data link services.

Note: In the SPR (Ref m), Category 1 was described, in part as Normal Communications and Category 2 was termed Supplemental Communications. The Normal and Supplemental terminology were confusing and misleading when applied to AIS and MET data link services.

This document identifies the stakeholders, the operational needs, the justification for AIS and MET data link services, and the needed change processes. Operational scenarios and use cases (Appendix B) are also included along with examples of AIS and MET information that could be delivered by these services (Appendix C).

The AIS and MET data link services will be used to support tactical/near-term as well as strategic/planning decisions in multiple operating environments. In addition, there are multiple applications, both ground and airborne, that can benefit from the data link transmission of aircraft derived meteorological information.

In addition to the communications link, a Ground Data Link Processing Function (GDLPF), an Onboard Data Link Processing Function (ODLPF), and interfaces with installed aircraft systems or portable devices will be needed to support these AIS and MET data link services. There are existing data link systems that should be able to meet the requirements for providing such services at some level.

Certification (and operational approval) authorities will need a detailed statement of the intended function(s) and operational use(s) for such future AIS and MET data link services for use in evaluating whetherservices for use in evaluating whether the applicant's overall system is appropriate for those intended function(s) and the associated flight crew tasks. The operational concept and the use cases in Appendix B identify a set of envisioned high-level functional capabilities as listed below.

These functional capabilities should be considered for follow-on architectural recommendations, Minimum Aviation System Performance Standards (MASPS), and Minimum Operational Performance Standards (MOPS).

- Allow for multiple service providers to concurrently provide aeronautical information services and meteorological services to aircraft, through combinations of all modes of data link communications (broadcast, demand, and contract transmissions).
- Provide a means for a GDLPF to support multiple communications links.
- Provide a means for an ODLPF to support multiple communications links.
- Allow for the functionality of the ODLPF to be distributed and, in some cases, be housed virtually as software on portable devices.
- Provide a means for an ODLPF to provide information to multiple clients on the aircraft (e.g., Flight Management Function, displays, etc.) with operator-defined priority.
- Provide a means for an ODLPF or GDLPF to select from multiple communications links for weather downlink or crosslink applications with operator-defined priority.
- Support use of AIS and MET data link services for preflight planning.

From an industry and regulatory viewpoint, the timing of this effort is opportune, as high regional adoption, certification, and operational approval of AIS and MET services has taken place over the last decade in the United States (e.g., satellite-broadcast weather and Notices to Airmen (NOTAM)). More recently, air transport has begun to provide the means for flight crews to access AIS and MET data link services with the issuance of tablet computers for use on the flight deck. Along with aircraft cabin broadband and onboard local area connection (LAN) connectivity, the use of these tablets, or other portable wireless devices, to gain access to AIS and MET information for flight crew use is a logical development. RTCA Special Committee 206 recognizes that there will be significant experience gained in this process that will help drive future needs and progression toward data link becoming the primary (Category 1) means for disseminating AIS and MET information.

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1 INTRODUCTION

1.1 Background

Throughout the history of aviation, it has been a challenge to communicate with the flight crew onboard aircraft. Hand signals and light signals were used initially, and capabilities expanded tremendously with the advent of Very High Frequency (VHF)/High Frequency (HF) radio communication.

Today, affordable high-bandwidth data link communications are available nearly globally, and there is considerable bandwidth available everywhere of high quality. Based on this technology, a set of data link services has evolved to the point that reliable communication with aircraft is possible regardless of location, phase of flight, or what information is required. Data link services can provide high-quality, time-critical, and flight-critical information.

To ensure data link services are operationally viable, and stringent quality requirements are met, information must be collected and carefully pre-processed. Information is then transmitted to the aircraft via data link, where it is received, stored, and processed by onboard information management systems. Depending on its operational use, information can be retrieved and displayed graphically to the flight crew, or made available via other appropriate onboard visual and/or aural system interfaces. Certain information can also be auto-loaded into various onboard systems, including the Flight Management Function (FMF), prior to or after departure. Data linked information is intended to support operational decision making by the flight crew and provides a means to facilitate consistent information between ground and aircraft.

1.2 Purpose

This Concept of Use (ConUse) document describes system concepts and user applications for using data link for communicating aeronautical information service (AIS) and meteorological (MET) information to and from aircraft. Data link communications are a key performance-based capability in the future Next Generation Air Transportation System (NextGen) and Single European Sky Air Traffic Management (ATM) Research (SESAR) concepts.

Both NextGen and SESAR require new digital information services that enable improved data-driven decision support tools on the flight deck and in general aviation cockpits, as well as in ground-based ATM systems and dispatch functions, such as Flight Operations Centers (FOC). The future ATM concepts also make use of the aircraft as a platform to provide valuable automatic collection and reporting of aircraft-derived information. This ConUse addresses communication of such information to proximate aircraft (i.e., crosslink) and to ground users (i.e., downlink).

Note: Today, there are existing commercial and government data link systems that are used for communicating AIS and MET information. Most of those data link systems may only be used for strategic decision support; they are not intended to be used for tactical decision support. An example of such a system is the Federal Aviation Administration's (FAA) Flight Information Services – Broadcast (FIS-B) system.

1.3 AIS and MET Data Link Services Delivery

AIS and MET data link services support Flight Information Services (FIS), a component of Air Traffic Services (ATS) as defined in International Civil Aviation Organization (ICAO) *Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM)*

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