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User Requirements for Aerodrome Mapping Information

RTCA DO-272D
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FOREWORD

This report was prepared by RTCA Special Committee 217 (SC-217) and approved by the RTCA Program Management Committee (PMC) on September 22, 2015.

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.

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EXECUTIVE SUMMARY

Operations at large aerodromes have become a complex combination of many activities being performed by many individuals. This group of individuals includes pilots, air traffic controllers, apron controllers, surface vehicle operators, construction/maintenance crews, emergency/security personnel, commercial and cargo airline operations personnel, and general and business aviation operations personnel. All of these individuals must work collaboratively to ensure safe efficient flight operations at the aerodrome. Furthermore, all of these individuals, or *users*, require some knowledge of the aerodrome layout.

Traditionally, pilots navigate on the surface based on visual aids such as airfield markings, signs, and lighting, in conjunction with a paper chart of the aerodrome layout. Radio communications between air traffic control (ATC) and pilots are used to obtain the route to follow while on the surface. ATC issues route instructions, using explicit phraseology along with unique names of legs along the route. ATC must remember the routes given to all aircraft, as well as all aircraft locations, so that no one is directed into a potential collision. If there is a potential for collision, hold short instructions can be issued over the radio frequency to constrain aircraft movements. To maintain safe separation, surveillance on the aerodrome surface is performed by the flight crews based primarily on the "see-and-avoid" principle. Similarly, ATC performs the surveillance task based primarily on visual cues. Occasionally, both pilots and controllers will use radio communications to confirm positions of relevant traffic. From this brief description of aircraft movements, it is apparent that both ATC and pilots require geospatial information about the aerodrome layout (e.g. the relative location and orientation of runways, taxiways, and stands).

In order to support flight operations at aerodromes, several other activities are required, each performed by separate organizations and/or facilities. The aerodrome authority is responsible for construction and maintenance of aerodrome resources such as buildings, pavement, markings, and landing systems (e.g., ILS). They are also responsible for providing emergency response teams such as fire/rescue and aerodrome security in some cases. Commercial and cargo airline operators perform activities such as apron control, aircraft maintenance and fueling, baggage and cargo handling, catering services, crew and aircraft scheduling, flight planning, and ticketing. They also manage training activities such as flight simulations to assure pilot currency. Finally, General Aviation (GA) and Business Aviation operations are typically supported by Fixed Base Operators (FBOs). FBOs support GA and Business Aviation operations by providing maintenance, fueling, flight planning, and local ground transportation services. As with pilots and controllers, all of these users also require geospatial information.

The information contained in this document has been compiled by industry for the purpose of stating surface mapping information requirements for users such as those described above. The requirements presented are not all-inclusive, but represent those of more immediate concern. Airworthiness authorities, civil aviation authorities, and the aviation industry urge aerodrome mapping database (AMDB) originators and integrators to use this document when providing those data to system designers and users. In addition, this document provides guidance material on structure of AMDBs. Based on the availability of standardized current AMDBs, a variety of applications can be envisioned. Several are described in this document. This document has been written under the assumption that if all users are using consistent aerodrome mapping data, operations can be improved, and new capabilities can be realized.

The document is organized as follows:

- Section 1 provides background information with respect to the purpose of developing AMDB requirements
- Section 2 describes aerodrome mapping data considerations that are important when attempting to comply with this document
- Section 3 provides general requirements and recommendations for AMDB development

- Section 4 provides more detailed content requirements and specific numerical requirements
- Section 5 describes the membership of SC-217
- Appendix A provides an overview of the types of applications that may make use of AMDBs
- Appendix B is a glossary of relevant terms
- Appendix C lists important abbreviations and acronyms
- Appendix D may be used as guidance material when creating AMDBs to meet the quality requirements specified in this document

REVISIONS TO RTCA DO-272C/EUROCAE ED-99C

The following list is a summary of the major changes made to RTCA DO-272C/EUROCAE ED-99C for the DO-272D and ED-99D versions.

Editorial errors, mainly reported by the users of the previous version of the document, or found during the update of the document were corrected.

The reference list was updated.

Scope Statement updated, Section 1.2

Definition of Terms and Conventions updated, including the explanation of the new rule numbering system, Section 1.2.1.

SWIM Considerations in Relation to AMDB Standards added, Section 1.4.

Definition of 2D and 3D added, Section 2.1.Definition of Database Update Cycles and Timeliness updated, Section 3.7.

General SWIM requirements added in Section 3.9.

Capture Rules for Aerodrome Structures updated, Section 3.12.2.

Section 4 reordered as follows:

4.1 Data Elements (was 4.3)

4.2 Geometry (was 4.1)

4.3 Attributes (was 4.2)

Cross-referencing to Geometric Constraint Rules added, Section 4.1.

Attribute definitions harmonized, Section 4.1.

New feature type ATC Blind Spot added, Section 4.1.9.

ASRN feature concepts expanded to include Deicing Areas, Aprons, and Parking Stands as well Functional Requirements, Section 4.1.10.

Aerodrome Surface Lighting feature type updated, Section 4.1.11.

New feature type Aerodrome Signs added, Section 4.1.13.

New feature type Position Marking added, Section 4.1.3.8

Section 4.2, Geometry, significantly re-organized and clarified, including new rule numbering system that applies to all requirements and recommendations throughout the document.

Section 4.3, Attributes, significantly re-organized, including new rule numbering system and new concept of conditional attributes. Functional constraints moved from Attributes section to feature type definitions in Section 4.1.

Section 5 provides the membership list of SC-217.

This summary of revisions was included.

Numerical Requirements updated to maintain compatibility with ICAO, Section 4.4.4.

Glossary (Appendix B) updated to align with ICAO, RTCA and EUROCAE standards.

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1 PURPOSE AND SCOPE

1.1 Introduction

The information contained in this document has been compiled for the purpose of stating aerodrome surface mapping information requirements for aeronautical uses. The term aerodrome is used in this document to include: Aerodromes, Heliports, and Sea-Plane aerodromes. The requirements are not all-inclusive, but represent those of more immediate concern. As future applications are developed, more stringent numerical requirements may be needed. Airworthiness authorities, civil aviation authorities, and the aviation industry urge the aerodrome mapping data originators and integrators to use this information when providing those data to system designers and users.

Based on the availability of standardized aerodrome mapping databases (AMDBs), a wide variety of applications can be envisioned (Appendix A). It is important to note that multiple user classes can benefit from using these databases, for example: pilots, controllers, aerodrome managers, and aerodrome emergency/security personnel. Each of the applications listed below are described in detail in Appendix A.

Applications of AMDBs:
Digital charts
Traffic awareness, runway incursion prevention (including D_TAXI)
Position and route awareness, runway excursion prevention
Display of notices to airmen
Synthetic/enhanced vision
Resource management
Training and simulation
Facility management
Emergency and security service management
Asset management

1.2 Scope

This document provides minimum requirements and reference material applicable to the content, origination, publication, and updating of aerodrome mapping information. The document also provides guidance to assess compliance and determination of the levels of confidence that need to be reached to support the types of applications listed in Appendix A. This document should be used to support the development and application of AMDBs. AMDBs represent a collection of aerodrome information that is organized and arranged for ease of electronic storage and retrieval in systems that support aerodrome surface movements, training, charting, and planning. AMDBs consist of one or more files containing information in a digital form that represent selected aerodrome features. This data includes geo-spatial data and metadata over a defined area. The files have a defined structure to permit an AMDB management system and other applications to make revisions that include additions, deletions, or modifications.

Following the distinction made between Aerodrome Mapping Data (AMD) and AMDBs in accordance with ICAO Annex 14 and ICAO Annex 15 SARPs (see also glossary definitions), the scope of RTCA DO-272D/EUROCAE ED-99D and RTCA DO-291C/EUROCAE ED-119C covers requirements for AMDBs and the specific AMD they

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contain in support of the intended applications. It should be noted that AMD can exist outside the context of this standard, and can be transformed into an AMDB, or exported from an AMDB.

Appendix A provides an overview of the types of applications that may make use of AMDBs. These application categories were used as guidance to ensure the defined AMDB user requirements could support the selected current and future capabilities.

The content generated/surveyed within the scope of this document is interchangeable according to the rules defined in RTCA DO-291C/EUROCAE ED-119C.

1.2.1 Definition of Terms and Conventions

The precise meaning of terms is essential for a clear understanding of spoken or written information. This understanding is critical in areas where safety is of concern. Certain terms and expressions used in this document have specific meanings that must not be misconstrued or applied incorrectly. These terms are defined in a glossary in Appendix B. Acronyms are described in Appendix C.

In addition, the following conventions have been adopted:

- The term "**should**" implies that compliance is not required, but is strongly recommended
- The term "**shall**" means that compliance is required

Requirements are specified in Sections 3 and 4 and are uniquely numbered to support requirements traceability procedures. Requirements ("**shall**" statements) are enumerated with identifiers in the format [AMDB-Rxxx] at the end of a sentence (prior to the period), where xxx is an identifier (ID) unique across all requirements in the document. The letter 'R' specifies this as a requirement.

Recommendations ("**should**" statements) are enumerated with an ID formatted as [AMDB-Dxxx] at the end of a sentence, where xxx is an ID unique across all recommendations in the document. The letter 'D' specifies this as a recommendation (design objective).

Each ID is specific to the version of the document in which it appears. However, an ID number associated with a requirement or recommendation will not change from one version to another unless the intent of the requirement changes. Requirement IDs will not change due to editorial or clarification modifications, or due to moving requirements to a different place in the document.

If the intent of a requirement or recommendation changes, the ID used in the previous version will be eliminated and never reused. A new ID is assigned for the new document version. For example, if the requirement, "The metric system **shall** be used for all linear measurements (e.g., runway length)" were modified to state, "Imperial units **shall** be used for all linear measurements (e.g., feet for runway length)", the requirement ID would *not* be changed, since the intent of the requirement is still to specify the type of units that are used for linear measurements.

However, if it were modified to state, "All measurements **shall** identify the units in which they are measured", the requirement ID would change, since the scope of the requirement

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expanded to include all measurements, and the concept of having to include the units with the measurement was introduced.

Requirements that are deleted or deprecated will also never have their identifiers reused.

1.2.2 Reference Documents

(1) RTCA DO-200B/EUROCAE ED-76A, *Standards for Processing Aeronautical Data* *Note: At the time of publication, RTCA DO-200A/EUROCAE ED-76 may still be applicable".*

(2) RTCA DO-201A/EUROCAE ED-77, *Industry Standards for Aeronautical Information*

(3) RTCA DO-276C/EUROCAE ED-98C, *User Requirements for Terrain and Obstacle Data*

(4) RTCA DO-291C/EUROCAE ED-119C, *Interchange Standards for Terrain, Obstacle, and Aerodrome Mapping Data*

(5) ICAO Annex 4, *International Standards and Recommended Practices – Aeronautical Charts*

(6) ICAO Annex 14, *International Standards and Recommended Practices – Aerodromes - Vol. I Aerodrome Design and Operations and Vol. II Heliports*

(7) ICAO Annex 15, *International Standards and Recommended Practices – Aeronautical Information Services*

(8) ICAO Doc. 9157, *Aerodrome Design Manual*

(9) ICAO Doc. 9674-AN/946, *World Geodetic System 1984 (WGS-84) Manual*

(10) ICAO Doc. 8643, *Aircraft Type Designators*

(11) FAA AC150/5300-18, *General Guidance and Specifications for Submission of Aeronautical Surveys to NGS: Field Data Collection and Geographic Information System (GIS) Standards, March, 2009*

1.3 Application of Standards

As stated in RTCA DO-200()/EUROCAE ED-76(), "the ultimate responsibility of ensuring data meets the quality for its intended use rests with the end-user".

Two versions of RTCA/EUROCAE Standards for Processing Aeronautical Data exist: DO-200A/ED-76 and DO-200B/ED-76A. This document does not presume which version is applicable and therefore used RTCA DO-200()/EUROCAE ED-76() to refer to the version enforced.

Figure 1-1 depicts the data integration processes that contribute to the development of an AMDB. Initially, data originators may collect aerodrome mapping data using various

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