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User Requirements for Aerodrome Mapping Information

RTCA DO-272B
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FOREWORD

This report was prepared by RTCA Special Committee 217 (SC-217) and EUROCAE Working Group 44 (WG-44) and approved by the RTCA Program Management Committee (PMC) on April 14, 2009.

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.

Since the RTCA is not an official agency of the United States Government, its recommendations may not be regarded as statements of official government policy unless so enunciated by the U.S. government organization or agency having statutory jurisdiction over any matters to which the recommendations relate.

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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 the same AMDB, 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 0 provides more detailed content requirements and specific numerical requirements
- 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
- Appendix E lists the membership of the committee that developed this document

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

The following list is a summary of the major changes made to RTCA DO-272A / EUROCAE ED-99A for the DO-272B and ED-99B 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 and amended.

RTCA DO-291A/EUROCAE ED-119A, *Interchange Standards for Terrain, Obstacle, and Aerodrome Mapping Data* was added to the reference list and is considered normative for the purposes of data interchange.

Clarifications and text enhancements were provided for the following document sections:

- Section 2.3.2 Completeness
- Section 2.3.3 Connectivity
- Section 3.11.2 Aerodrome Structures

A capture rule was added to make mandatory/optional requirements explicit:

- Section 4.3 Data Elements rule 4.3.0.2

Feature overlap, where allowed, was explicitly stated.

Geometrical/functional relations and constraints requirements were amended to reflect new features. The connectivity rules were revised. Deleted rules were marked.

Numerical requirements were amended to reflect the addition of new AMDB features. No changes were made to the numerical requirements of the existing AMDB features.

Definitions, features, attributes, and data content were revised to harmonize with AIXM5 and ARINC816. Following the revision process, changes were made to the Feature Catalogue. A brief summary of these changes follows:

- New features were added: Blastpad, Water, Hotspot, Aerodrome Surface Lighting;
- A new attribute idnumber was added to all features;
- A new attribute restacn was added to the RunwayElement, RunwayIntersection, RunwayDisplacedArea, TaxiwayElement, ApronElement, ParkingStandArea, DeicingArea features;
- Attribute pcn was inserted in the RunwayDisplacedArea feature;
- Attribute papivasi was replaced by attribute vasis for RunwayThreshold feature;
- Attribute surftype was changed to gsurftyp for ServiceRoad feature;
- Attributes vacc and vres were deleted from the ConstructionArea feature;
- Codelists feattype, surftype, gsurftyp, plysttyp, linsttyp, pntsttyp were modified;
- Feature attribute definitions were enhanced: vacc, hacc, vres, integr, revdate, acn;
- Feature attribute value domains were modified: width, brngtrue, brngmag, idstd;
- New attributes required by new features were added (example: idhot for the Hotspot feature.).

The membership list was updated and this summary of revisions was included.

REVISIONS TO RTCA DO-272/EUROCAE ED-99

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

A number of 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 and amended.

RTCA DO-291/EUROCAE ED-119, *Interchange Standards for Terrain, Obstacle, and Aerodrome Mapping Data* was added to the reference list and is considered normative for the purposes of data interchange.

The use of EGM-96 as the gravity model for the vertical reference system was changed from a recommendation to a requirement to harmonize with ICAO Standards and Recommended Practices.

Several changes were made to accommodate for Amendment 33 of ICAO Annex 15. This includes figures, definitions and numeric values (e.g. obstacle data collection surfaces).

The text to describe the severity levels of applications using the data was revised to harmonize with certification standards such as RTCA DO-178B/EUROCAE ED-12B.

Database update cycles were revised to accommodate more frequent deliveries of data than the AIRAC cycles.

User feedback was added to the list of possible verification and validation methods.

Requirements were added that define geometrical relations and constraints. The requirement concerning the overlap of polygon features was changed. Attributes were added to accommodate multi-use surfaces.

Requirements and definitions for functional constraints were added to the feature attribute section.

Accuracy requirements for *Medium* quality data sets were modified.

Appendix E of the previous version was removed. Data capture and content requirements were moved from Appendix E of previous version into Section 4 (Specific Requirements) of this version. Coding information appropriate for the exchange of data was removed and can now be found in RTCA DO-291/EUROCAE ED-119.

As appropriate, definitions and feature or attribute names as well as data content were revised to harmonize with RTCA DO-291/EUROCAE ED-119.

Service Roads and Displaced Threshold Areas were added as data elements. Clearways were removed.

The Glossary was revised to harmonize with RTCA DO-291/EUROCAE ED-119 and with the latest versions of ICAO annexes.

The membership list was updated and this summary of revisions was included.

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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, particularly on-board aircraft. 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

Chart information
Surveillance and runway incursion detection and alerting
Route and hold-short display and deviation detection and alerting
Display of digital ATIS information
Aerodrome surface guidance and navigation
Runway operations
Aerodrome and airline resource management
Training (flight simulation)
Aerodrome facility and asset management
Emergency and security service management
Notice To Airmen (NOTAM) and aeronautical data overlays
Synthetic vision

1.2 Scope

This document provides minimum requirements and reference material applicable to the content, origination, publication, updating, and enhancement 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.

Appendix A is intended to provide an overview of the types of applications that may make use of AMDBs. These application categories have been used to generate the requirements stated herein.

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