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User Requirements for Terrain and Obstacle Data

RTCA DO-276B
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FOREWORD

This report was prepared by Special Committee 217 (SC-217) 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.

Since 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

This document provides guidance for data gathering by data originators, for data processing by data integrators, for implementation by system designers, and for end use by the aviation community (e.g., air carriers, air traffic services, procedure designers). It is supplemental to the data processing requirements included in RTCA DO-200A/ EUROCAE ED-76/ and the exchange of data included in RTCA DO-291B / EUROCAE ED-119B.

The minimum set of user requirements applicable to terrain and obstacle data, from creation through the entire life cycle, are defined. Numerical requirements for source data necessary to accommodate the most stringent known application requirements are also defined. Collectively these define a set of requirements that satisfy this universal set of applications. It should be noted that the numeric requirements have been derived solely based on user requirements and not on the basis of acquisition cost. Types of errors associated with terrain and obstacles are identified and some means by which these errors may be mitigated are suggested. The accuracy, integrity, and resolution requirements for primary means of navigation have not been considered in this document.

The following four areas of applicability have been defined: Area 1 – The State; Area 2 – The Terminal Area (vicinity of aerodrome), Area 3 – Aerodrome Movement Area, and Area 4 – the CAT II or III Operation Area. The requirements for accuracy, integrity and resolution have been tailored to meet these needs. Area 3 was added to support aerodrome mapping requirements, and Area 4 is the former Area 3.

Guidance for certification or approval of systems or procedures that use terrain and obstacle databases is also provided. It is the responsibility of the applicant to demonstrate that the data meet the requirements for its intended application. The requirements stated in this document address the areas viewed by industry to be of most importance to certification. These areas cover database attributes including accuracy, resolution and integrity. The document also describes the creation and maintenance steps for databases and highlights the certification-related verification, validation and traceability requirements in those steps.

The document is organized as follows:

Section 1 provides background information regarding the purpose for developing terrain and obstacle data requirements.

Section 2 defines the terms terrain and obstacle, which is necessary to distinguish between features in an aviation database.

Section 3 defines the minimum set of attributes for terrain and obstacle databases. For each attribute there is a definition and the option of including a description and set of capture rules. For obstacles there is also a definition of the temporal requirements.

Section 4 defines the spatial extent of four areas for terrain and four areas for obstacles and the unique data requirements of each of these areas.

Section 5 provides guidance related to data quality management.

Section 6 provides guidance to data suppliers and certification authorities.

Appendix A is a glossary of relevant terms.

Appendix B lists important abbreviations and acronyms.

Appendix C provides an overview of the types of applications that may make use of terrain and obstacle databases.

Appendix D provides useful information related to data quality assessments.

Appendix E provides basic information on remote sensing technologies used in the generation of terrain databases.

Appendix F is a list of references.

Appendix G lists the membership of the committee that developed this document.

REVISIONS to RTCA DO-276/EUROCAE ED-98

The following list is a summary of the major changes made to RTCA DO-276 /EUROCAE ED-98 for the DO-276A and ED-98A 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.

The definitions of terrain and obstacles were changed to harmonize with ICAO Standards and Recommended Practices.

The use of EGM96 as the gravity model for the vertical reference system was changed to a requirement to harmonize with ICAO Standards and Recommended Practices.

The use of geographical coordinates rather than projected coordinates was made a requirement.

Several changes were made to accommodate for Amendment 33 of ICAO Annex 15. This includes definitions and the adoption of quality parameters for Areas 1, 2, 3, and 4.

Date, time stamp, effectivity, lighting, and marking attributes were added to reflect user requirements and to ensure compliance with the ISO 19000 series.

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

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

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

The membership list was updated.

This summary of revisions was included.

SECOND REVISIONS to RTCA DO-276/EUROCAE ED-98

The following list is a summary of the major changes made to RTCA DO-276A /EUROCAE ED-98A for the DO-276B and ED-98B versions.

- Definitions and feature or attribute names as well as data content were revised to harmonize with RTCA DO-291 Revision B/EUROCAE ED-119 Revision B; Interchange Standards for Terrain, Obstacle, and Aerodrome Mapping Data.
- RTCA DO-291 Revision B/EUROCAE ED-119 Revision B references have been harmonized with this new revision of DO-276 / ED-98.
- Several changes were made to accommodate for Amendment 36 of ICAO Annex 15, Thirteenth Edition; July 2010. This includes definitions for Area-2, Area-3, Area-4, and Terrain and Obstacle collection / numerical requirements.
- Changes were made to the format of section 3, to clarify for each attribute its definition, description, and capture rules and whether the attribute is mandatory or optional.
- Added a section 3.5 on obstacle temporality.
- The definitions of terrain and obstacles were changed to harmonize with ICAO Standards and Recommended Practices.
- User feedback was added to the list of possible verification and validation methods.
- The Glossary was revised to harmonize with RTCA DO-291 Revision B / EUROCAE ED-119 Revision B.
- 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.
- The membership list was updated.

This summary of revisions was included.

TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

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1 PURPOSE AND SCOPE

1.1 Introduction

This document was written to identify requirements for terrain and obstacle data.

Data originators require the quality characteristics to be defined, including specific numerical values, in order to provide data for use in applications. Appendix C provides some illustrative application examples.

Certification authorities and the end users require information to ensure that terrain and obstacle data satisfy the intended applications.

1.2 Scope

This document defines the minimum user requirements applicable to the origination and publication of terrain and obstacle data from creation through the entire life cycle of the data. Data processing should be accomplished in accordance with RTCA DO-200A / EUROCAE ED-76. This document provides a minimum list of attributes associated with the terrain and obstacle data and a description of associated errors that may need to be addressed.

The numerical values in Section 4 are defined to accommodate the most stringent known application requirements, and not on a basis of acquisition cost. The accuracy, integrity, and resolution requirements for primary means of navigation have not been considered in this document.

Additionally, guidance material is provided to assist the certification process of an application using terrain and obstacle data.

Land use/land cover database requirements have not been specifically addressed in this document.

1.3 Definition of Terms

This document contains specific definitions for terrain and obstacles (see section 2.2). A glossary of terms used in this document is provided in Appendix A. A full appreciation of these terms (e.g., resolution, post spacing, etc.) is critical to understanding this document.

1.4 Application of This Document

Figure 1-1 describes the data flow that contributes to the design and development of terrain and obstacle databases.

As a first step, each individual State, appropriate delegated agencies or private organisations originate the data. It is beyond the scope of this document to mandate requirements on the originators of such data as it is assumed that they already follow clearly identified professional standards, specific requirements and methodologies. Nevertheless, it is recognised that *quality* requirements derived from the system designer or the end user specifications may be equally applicable to the data originator.