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

# User Requirements for Terrain and Obstacle Data

RTCA DO-276C
September 22, 2015

Prepared by: SC-217

Copies of this document may be obtained from

RTCA, Inc.

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

Please visit the RTCA Online Store for document pricing and ordering information

## FOREWORD

This report was prepared by Special Committee 217 (SC-217) and approved by the RTCA Program Management Committee 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 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.

This Page Intentionally Left Blank

## EXECUTIVE SUMMARY

This document provides guidance for data gathering by data originators, for data processing by data providers, for implementation by application integrators, 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-200B/EUROCAE ED-76A and the exchange of data included in RTCA DO-291C/EUROCAE ED-119C.

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 are used, as defined per ICAO Annex 15 (Ref. 5): 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.

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.

*Note: Section and paragraph referencing in this document is done with (for example) – Section 6.1.2 – where the Section is the number 6 and 1.2 is the specific paragraph number in that Section.*

The Membership List was updated, in Section 7.

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 provides recommendations for post spacing and Polar Region Data

Appendix G is a list of references.

## REVISIONS to RTCA DO-276B/EUROCAE ED-98B

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

Definition of Term and Conventions updated, including the explanation of the new rule numbering system, Section 1.3.

Terrain Data Attributes updated to maintain compatibility with ICAO and address Polar Regions, Section 3.2.

Obstacle Data Attributes updated to maintain compatibility with ICAO and to address Rotorcraft Operations, Section 3.3.

Added new temporal data attributes for obstacles, Sections 3.3.21 and 3.3.22, and modified prior temporal data attributes, Sections 3.3.19 and 3.3.20.

Added new capture rules for Obstacle Geometry Type, Section 3.3.26.

Numerical Requirements for Terrain and Obstacles updated to maintain compatibility with ICAO and to address Rotorcraft Operations, Section 4.

Principles of Data Collection for Terrain updated, Section 6.1.1.

Principles of Mathematic Transformations for Terrain updated, Section 6.1.2.

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

New Appendix F, RECOMMENDATIONS FOR POST SPACING AND POLAR DATA, was added.

List of References (Appendix G) updated.

The Membership List was updated.

This summary of revisions was included.

This Page Intentionally Left Blank

## TABLE OF CONTENTS

## TABLE OF TABLES



## TABLE OF FIGURES

This Page Intentionally Left Blank

# 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-200B/EUROCAE ED-76A. 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 and Conventions

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.

In addition, the following conventions have been adopted:

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

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 [TERR-RXXX] for terrain and [OBST-RXXX] for obstacles 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 [TERR-DXXX] for terrain and [OBST-DXXX] for obstacles 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