

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

## **Interchange Standards for Terrain, Obstacle, and Aerodrome Mapping Data**

RTCA DO-291B  
September 28, 2011

Prepared by: SC-217  
© 2011 RTCA Inc.

Copies of this document may be obtained from

RTCA, Inc.

Telephone: 202-835-9333

Facsimile: 202-835-9474

Internet: [www.rtca.org](http://www.rtca.org)

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

## 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 September 28, 2011.

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 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.

Currently in preview, click buy full version

This Page Intentionally Left Blank

## EXECUTIVE SUMMARY

A common database interchange standard for terrain, obstacle, and aerodrome databases is a key success factor for the implementation of digital functions in the aviation domain. It will enable a common interchange between data originators, data integrators, and system designers. It increases efficiency and safety.

The RTCA/EUROCAE documents DO-272C/ED-99C and DO-276B/ED-98B specify the user requirements for terrain, obstacle, and aerodrome database content and quality.

This document sets guidelines and requirements to develop a data interchange format for terrain, obstacle, and aerodrome data generated in compliance to RTCA DO-272C/EUROCAE ED-99C and RTCA DO-276B/EUROCAE ED-98B.

This interchange standard was generated on the basis of the ISO 19100 (geographic information) series of standards as applied to terrain, obstacle, and aerodrome mapping databases used in aviation. The list of relevant ISO documents is given in Section 1.2. It is recommended that users of this document review these ISO standards. They are available from ISO at:

1, Rue de Varembe, CH-1211 Geneva 20, Switzerland

Telephone: +41 22 749 01 11

URL: [www.iso.org](http://www.iso.org)

E-mail: [central@iso.org](mailto:central@iso.org)

This standard contains ISO compliant data product specifications for terrain, obstacle, and aerodrome databases that are to be interchanged. These specifications consist of scope, identification, metadata, content information, reference system, data quality information, data capture information, and maintenance information requirements. These requirements will establish a basis that can be used by data originators, data integrators, and system designers to implement a physical interchange format. Interoperability among different physical formats can be facilitated by complying with this standard.

Currently in preview, click buy full version

This Page Intentionally Left Blank

## TABLE OF CONTENTS

1	INTRODUCTION .....	1
1.1	Scope .....	2
1.2	References .....	3
1.3	Terms, Definitions, and Assumptions .....	5
1.4	Abbreviations.....	5
1.5	General Structure and Content of a Data Product Specification .....	6
2	TERRAIN DATA PRODUCT SPECIFICATION REQUIREMENTS .....	9
2.1	Overview .....	9
2.2	Specification Scopes.....	9
2.3	Data Product Identification.....	11
2.4	Data Content and Structure.....	14
2.5	Reference Systems.....	17
2.6	Data Quality.....	18
2.7	Data Capture .....	20
2.8	Data Maintenance .....	21
2.9	Portrayal.....	22
2.10	Data Product Delivery .....	23
2.11	Additional Information .....	24
2.12	Metadata .....	24
3	OBSTACLE DATA PRODUCT SPECIFICATION REQUIREMENTS .....	35
3.1	Overview .....	35
3.2	Specification Scopes.....	35
3.3	Data Product Identification.....	37
3.4	Data Content and Structure.....	39
3.5	Reference Systems.....	58
3.6	Data Quality.....	60
3.7	Data Capture .....	61
3.8	Data Maintenance .....	62
3.9	Portrayal.....	63
3.10	Data Product Delivery .....	64
3.11	Additional Information .....	66

3.12	Metadata .....	66
4	AERODROME MAPPING DATA PRODUCT SPECIFICATION REQUIREMENTS .....	74
4.1	Overview .....	74
4.2	Specification Scopes.....	75
4.3	Data Product Identification.....	77
4.4	Data Content and Structure.....	79
4.5	Reference Systems.....	130
4.6	Data Quality.....	132
4.7	Data Capture .....	133
4.8	Data Maintenance .....	134
4.9	Portrayal.....	135
4.10	Data Product Delivery .....	136
4.11	Additional Information .....	138
4.12	Metadata .....	138
5	QUALITY CONSIDERATIONS .....	145
5.1	Applying Quality Evaluation Procedures to Dynamic Datasets.....	146
5.2	Reporting Data Quality.....	147
6	MAINTENANCE AND UPDATE CONSIDERATIONS .....	149
6.1	Source Analysis and Evaluation Procedures .....	150
6.2	Clarification of Source Anomalies Procedures .....	151
6.3	Data Input Procedures .....	152
6.4	Data Validation Procedures.....	152
6.5	Data Verification Procedures.....	152
6.6	Update Mechanism.....	152
6.7	Update approach and application context.....	152
6.8	Update primitives .....	152
7	TEMPORAL CONSIDERATIONS .....	155
7.1	Temporality .....	155
7.2	Sample Conformance Criteria .....	155
A	EXAMPLES OF AMDB DATA .....	A-1
B	METADATA ELEMENTS .....	B-1

C	METADATA CODE LISTS AND ENUMERATIONS.....	C-1
D	GLOSSARY .....	D-1
E	ABBREVIATIONS AND ACRONYMS .....	E-1
F	MEMBERSHIP LIST .....	F-1

Currently in preview, click buy full version

## TABLE OF FIGURES

Figure 1-1 Data flow from originator to end user .....	1
Figure 1-2 Dataset transfer approach.....	2
Figure 1-3 Scope of interchange standard (shaded area) .....	3
Figure 1-4 Relationship between a DPS and metadata .....	6
Figure 2-1 Digital elevation model .....	9
Figure 2-2 Terrain definition .....	9
Figure 2-3 UML model for scope information for terrain data.....	11
Figure 2-4 UML model for identification information for terrain data.....	13
Figure 2-5 UML model for coverages for terrain data.....	15
Figure 2-6 Model integration diagram for terrain data .....	16
Figure 2-7 Application schema for terrain data .....	17
Figure 2-8 UML model for reference system information for terrain data.....	18
Figure 2-9 UML model for quality information for terrain data.....	20
Figure 2-10 UML model for data capture information for terrain data .....	21
Figure 2-11 UML model for maintenance information for terrain data .....	22
Figure 2-12 UML model for portrayal information for terrain data .....	23
Figure 2-13 UML model for delivery information for terrain data.....	24
Figure 2-14 Terrain metadata – overview .....	25
Figure 2-15 Terrain metadata – identification .....	26
Figure 2-16 Terrain metadata – quality.....	27
Figure 2-17 Terrain metadata – maintenance.....	28
Figure 2-18 Terrain metadata – spatial representation.....	29
Figure 2-19 Terrain metadata – reference system.....	30
Figure 2-20 Terrain metadata – distribution .....	31
Figure 2-21 Terrain metadata – extent.....	32
Figure 2-22 Terrain metadata – citation and responsible party.....	33
Figure 3-1 Obstacle features .....	35
Figure 3-2 UML model for scope information for obstacle data .....	37
Figure 3-3 UML model for identification information for obstacle data.....	39
Figure 3-4 Model integration diagram for obstacle data.....	40
Figure 3-5 Application schema for obstacle data.....	41
Figure 3-6 Feature types for obstacle data .....	42
Figure 3-7 Attribute enumeration types for obstacle data.....	43

Figure 3-8 UML model for reference system information for obstacle data .....	59
Figure 3-9 UML model for quality information for obstacle data .....	61
Figure 3-10 UML model for data capture information for obstacle data.....	62
Figure 3-11 UML model for maintenance information for obstacle data .....	63
Figure 3-12 UML model for portrayal information for obstacle data.....	64
Figure 3-13 UML model for delivery information for obstacle data .....	65
Figure 3-14 Obstacle metadata – overview.....	66
Figure 3-15 Obstacle metadata – identification .....	67
Figure 3-16 Obstacle metadata – quality .....	68
Figure 3-17 Obstacle metadata – maintenance .....	69
Figure 3-18 Obstacle metadata – reference system.....	70
Figure 3-19 Obstacle metadata – distribution .....	71
Figure 3-20 Obstacle metadata – extent.....	72
Figure 3-21 Obstacle metadata – citation and responsible party .....	73
Figure 4-1 Aerodrome features .....	74
Figure 4-2 Runway features.....	75
Figure 4-3 UML model for scope information for aerodrome mapping data.....	77
Figure 4-4 UML model for identification information for aerodrome mapping data.....	79
Figure 4-5 Model integration diagram for aerodrome mapping data.....	80
Figure 4-6. Application schema for aerodrome mapping data.....	81
Figure 4-7 Runway feature types for aerodrome mapping data.....	82
Figure 4-8 Taxiway feature types for aerodrome mapping data .....	83
Figure 4-9 Apron feature types for aerodrome mapping data.....	84
Figure 4-10 Construction area feature types for aerodrome mapping data.....	85
Figure 4-11 Helipad feature types for aerodrome mapping data .....	85
Figure 4-12 Vertical structure feature types for aerodrome mapping data .....	86
Figure 4-13 Surface lighting types for aerodrome mapping data .....	86
Figure 4-14 Survey control point types for aerodrome mapping data .....	87
Figure 4-15 Water types for aerodrome mapping data .....	87
Figure 4-16 ASRN feature types for aerodrome mapping data .....	88
Figure 4-17 Code list attribute types for aerodrome mapping data.....	89
Figure 4-18 Enumeration attribute types for aerodrome mapping data .....	90
Figure 4-19 UML model for reference system information for aerodrome mapping data .....	132
Figure 4-20 UML model for quality information for aerodrome mapping data .....	133
Figure 4-21 UML model for data capture information for aerodrome mapping data.....	134

Figure 4-22 UML model for maintenance information for aerodrome mapping data.....	135
Figure 4-23 UML model for portrayal information for aerodrome mapping data.....	136
Figure 4-24 UML model for delivery information for aerodrome mapping data.....	137
Figure 4-25 Aerodrome mapping metadata – overview .....	139
Figure 4-26 Aerodrome mapping metadata – identification.....	140
Figure 4-27 Aerodrome mapping metadata – quality .....	141
Figure 4-28 Aerodrome mapping metadata – maintenance.....	141
Figure 4-29 Aerodrome mapping metadata – reference system .....	142
Figure 4-30 Aerodrome mapping metadata – distribution.....	142
Figure 4-31 Aerodrome mapping metadata – extent.....	143
Figure 4-32 Aerodrome mapping metadata – citation and responsible party .....	144
Figure 6-1 Data management flow.....	151

## TABLE OF TABLES

Table 2-1 Identification of specification scopes for terrain data.....	10
Table 2-2 Identification information for terrain data.....	12
Table 2-3 Coverage identification for terrain data.....	15
Table 2-4 Reference system identification for terrain data.....	18
Table 2-5 Quality identification for terrain data.....	19
Table 2-6 Data capture identification for terrain data.....	21
Table 2-7 Maintenance identification for terrain data.....	22
Table 2-8 Portrayal information for terrain data.....	22
Table 2-9 Delivery format information for terrain data.....	23
Table 2-10 Delivery medium information for terrain data.....	24
Table 3-1 Identification of specification scopes for obstacle data.....	36
Table 3-2 Identification information for obstacle data.....	38
Table 3-3 Default values for obstacle feature attributes.....	56
Table 3-4 Required attributes for supplemental obstacle features.....	56
Table 3-5 Reference system identification for obstacle data.....	59
Table 3-6 Quality identification for obstacle data.....	61
Table 3-7 Data capture identification for obstacle data.....	62
Table 3-8 Maintenance identification for obstacle data.....	63
Table 3-9 Portrayal information for obstacle data.....	63
Table 3-10 Delivery format information for obstacle data.....	64
Table 3-11 Delivery medium information for obstacle data.....	65
Table 4-1 Identification of specification scopes for aerodrome mapping data.....	76
Table 4-2 Identification information for aerodrome mapping data.....	78
Table 4-3 Default values for aerodrome feature attributes.....	128
Table 4-3a Temporal default values for aerodrome feature attributes.....	128
Table 4-4 Required attributes for supplemental aerodrome features.....	129
Table 4-5 Reference system identification for aerodrome mapping data.....	131
Table 4-6 Quality identification for aerodrome mapping data.....	133
Table 4-7 Data capture identification for aerodrome mapping data.....	134
Table 4-8 Maintenance identification for aerodrome mapping data.....	135
Table 4-9 Portrayal information for aerodrome mapping data.....	135
Table 4-10 Delivery format information for aerodrome mapping data.....	136
Table 4-11 Delivery medium information for aerodrome mapping data.....	137

Table B-1 Metadata element descriptions – about the metadata.....	B-1
Table B-2 Metadata element descriptions – identification .....	B-1
Table B-3 Metadata element descriptions – quality.....	B-2
Table B-4 Metadata element descriptions – maintenance.....	B-3
Table B-5 Metadata element descriptions – spatial representation.....	B-4
Table B-6 Metadata element descriptions – reference system.....	B-4
Table B-7 Metadata element descriptions – distribution .....	B-5
Table B-8 Metadata element descriptions – extent .....	B-6
Table B-9 Metadata element descriptions – citation and responsible party.....	B-7

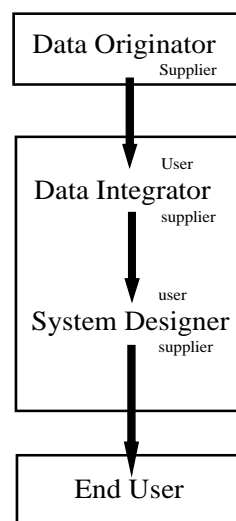
## 1 INTRODUCTION

Improved common situational awareness and applications such as Terrain Awareness and Warning Systems (TAWS), advanced navigation displays, taxi situational awareness displays, Runway Incursion Prevention Systems (RIPS), and Synthetic Vision Systems (SVS) will enhance the safety and efficiency of aircraft operations in-flight, during approach/take-off, and on the aerodrome surface. These developments are information-dependent and must use accurate, reliable, and up-to-date terrain, obstacle, and aerodrome mapping data. This implies an interchange process between data originators, integrators, and users based on common agreed-upon information interchange standards. These standards will constitute a foundation upon which the tailored end-user applications may be built.

This interchange standard includes data product specifications (DPSs) for the exchange of database content generated/surveyed within the scope of RTCA DO-272C/EUROCAE ED-99C: "User Requirements for Aerodrome Mapping Information" and RTCA DO-276B/EUROCAE ED-98B: "User Requirements for Terrain and Obstacle Data". Compliance with this interchange standard will ensure that RTCA DO-272C/EUROCAE ED-99C and RTCA DO-276B/EUROCAE ED-98B requirements are met.

This interchange standard is compliant with the ISO 19100 (geographic information) series of standards.

This standard specifies requirements for scope, identification, metadata, content, reference system, quality, capture, and maintenance information. These requirements establish a basis that can be used by data originators, data integrators, and system designers to implement a physical interchange format that supports the required data flow (Figure 1-1). Interoperability among different physical formats can be facilitated by complying with this standard.



**Figure 1-1** Data flow from originator to end user