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

Interchange Standards for Terrain, Obstacle, and Aerodrome Mapping Data

RTCA DO-291C
September 22, 2015

Prepared by: SC-217
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RTCA, Inc.

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

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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.

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- 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.

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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-272D/ED-99D and DO-276C/ED-98C 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-272D/EUROCAE ED-99D and RTCA DO-276C/EUROCAE ED-98C.

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 Varembé, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 749 01 11
URL: www.iso.org
E-mail: 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.

REVISIONS to RTCA DO-291B/EUROCAE ED-119B

The following list is a summary of the major changes made to RTCA DO-291B/EUROCAE ED-119B for the DO-291C and ED-119C 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.

The Obstacle Feature Catalog, Section 3.6 and the AMDB Feature Catalog, Section 4.6, have been auto-generated from a Unified Modelling Language (UML) implementation of these two data models. The remainder of this document has been updated to reflect the content of these UML models.

The Obstacle and Aerodrome Mapping Data Production Specification Requirement have been updated to reflect the changes made to RTCA DO-276C/EUROCAE ED-98C and RTCA DO-272D/EUROCAE ED-99D.

Reference Systems requirements were expanded, Section 4.9.

A new Section 4.17, Aerodrome Mapping Exchange Formats, has been added.

A new Section 4.18, Data management, Data Formats and SWIM Related Considerations has been added.

A new Section 5, Technical SWIM Requirements, has been added.

Glossary (Appendix D) has been updated to align with ICAO, RTCA and EUROCAE standards.

The Membership List was updated, in Section 9.

This summary of revisions was included.

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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-272D/EUROCAE ED-99D: "User Requirements for Aerodrome Mapping Information" and RTCA DO-276C/EUROCAE ED-98C: "User Requirements for Terrain and Obstacle Data". Compliance with this interchange standard will ensure that RTCA DO-272D/EUROCAE ED-99D and RTCA DO-276C/EUROCAE ED-98C 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.

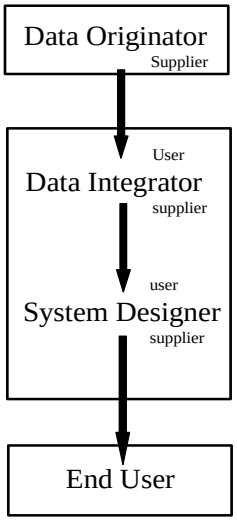


Figure 1-1: Data flow from originator to end user

According to ISO 19109, successful data interchange implies delivery, receipt, and interpretation of data among communicating parties. This may be achieved by two approaches, both of which are supported in this interchange standard:

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- data interchange by data set transfer
- data interchange by transaction or message

This interchange standard provides the Common Application Schema necessary to perform the interoperable data interchange.

The data set transfer approach is depicted in Figure 1-2. This approach requires an interchange process that is based upon a common application schema known by the suppliers and users who intend to exchange information. Data are transformed into a common transfer format based upon an encoding process that is defined by a mapping between the supplier application schema and the common application schema. A similar mechanism decodes the common transfer data set to generate the user data. This model is suitable for base map data that constitute the fundamental part of the total information interchange needed in the context of terrain, obstacle, and/or aerodrome mapping data.

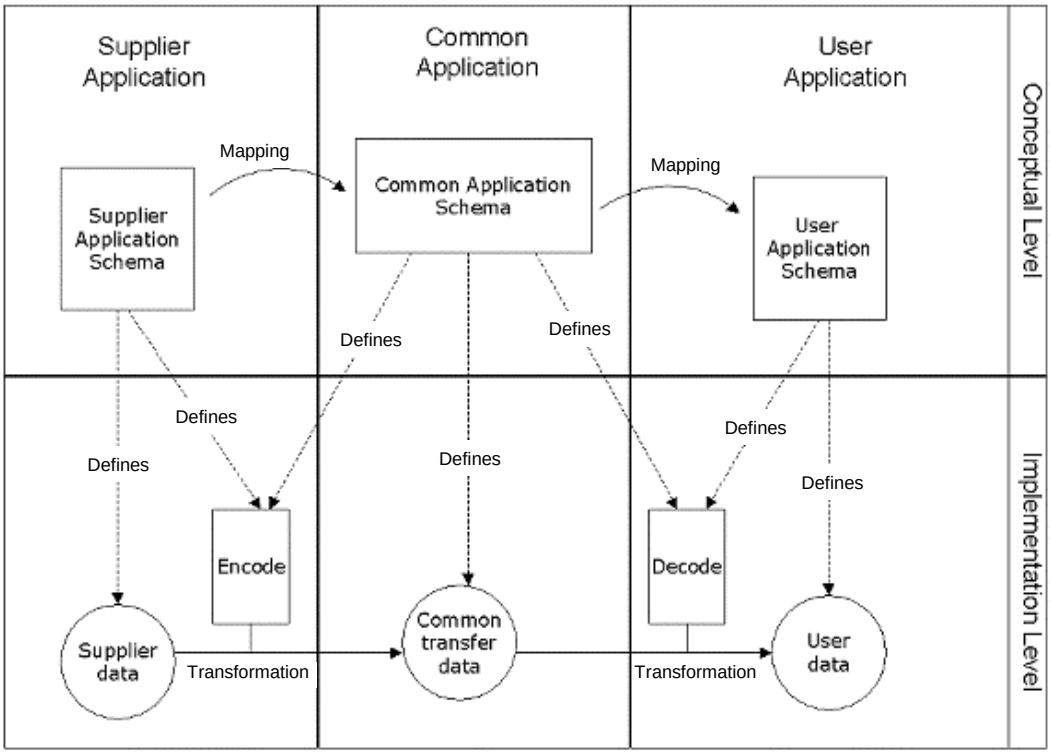


Figure 1-2: Data set transfer approach

The message based approach relates to the definition of information services as envisaged in the context of SWIM. In the case of a Request/Reply Message Exchange Pattern (MEP), the Common Application Schema defines the service consumer request and the service provider reply under the form of a message understood by both parties. In the case of a Publish/Subscribe Message Exchange Pattern, additional messages may be foreseen such as for notification purposes. This interchange standard provides requirements for the Request/Reply Message Exchange Pattern (MEP).

Vertical Structures (points, lines and polygons) captured and delivered under the provisions of RTCA DO-272D/EUROCAE ED-99D for Aerodrome Mapping Databases may be duplicated or be similar in location and elevation to Obstacles captured and delivered under the provisions of RTCA DO-276C/EUROCAE ED-98C for Terrain and Obstacle

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Databases. This is intentional as the two sets of provisions are designed to meet different functions and be used in different applications. Users of these two data types in a single application should be aware of this situation.

Complete information on Vertical Structures and Obstacles, in the appropriate format for the individual documents, are to be provided.

1.1 Scope

This standard describes requirements for the interchange of geographic data products that represent terrain, obstacles, and aerodrome mapping features. These requirements apply the concepts of the ISO 19100 series of standards to previously published requirements for data content and quality. Specifically, the normative part of this standard represents an intermediate specification level between abstract conceptual requirements (RTCA DO-272D/EUROCAE ED-99D, RTCA DO-276C/EUROCAE ED-98C, and ISO 19115) and a compliant interchange implementation.

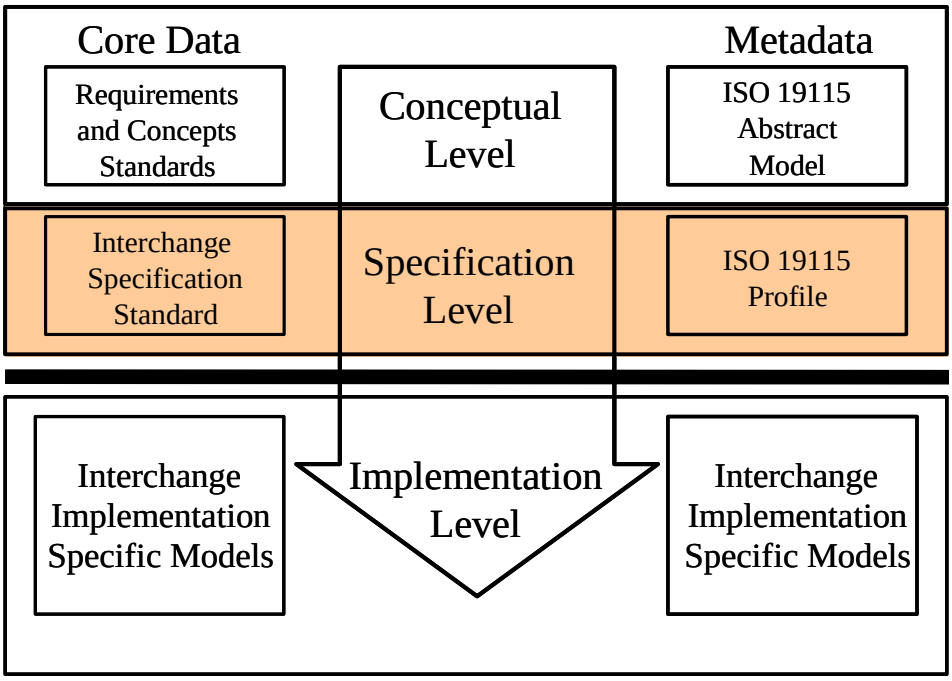


Figure 1-3: Relation between Conceptual Level, Specification Level and Implementation Level

In addition this interchange standard provides an informative AMXM XML Schema which for example may be used to implement AMDB information services. It is not the intent of this interchange standard to impose any physical interchange format on the user. This is solely to be agreed upon by the involved parties as may be the case within a community of interest using SWIM. However, the provided AMXM XML Schema may be used to implement a compliant information service.

Feature relationships, data capture rules, and structural constraints are not considered within the scope of the data interchange standard. It is assumed that they are applied in accordance with RTCA DO-272D/EUROCAE ED-99D and RTCA DO-276C/EUROCAE ED-98C during the data production process. It is the responsibility of a given data interchange implementation to ensure that structural requirements are met.

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1.2 References

1.2.1 Normative References

The following normative publications were taken into consideration during the development of this standard. As all normative publications are subject to revision, parties to agreements based on this standard are invited to apply the most recent editions.

RTCA DO-200B/EUROCAE ED-76A: Standards for Processing Aeronautical Data

RTCA DO-201A/EUROCAE ED-77: Standards for Aeronautical Information

RTCA DO-272D/EUROCAE ED-99D: User Requirements for Aerodrome Mapping Information

RTCA DO-276C/EUROCAE ED-98C: User Requirements for Terrain and Obstacle Data

ICAO Annex 4: International Standards and Recommended Practices – Aeronautical Charts

ICAO Annex 11: International Standards and Recommended Practices – Air Traffic Services

ICAO Annex 14: International Standards and Recommended Practices Aerodromes Volume I – Aerodrome Design and Operations

ICAO Annex 14: International Standards and Recommended Practices Volume II - Heliports

ICAO Annex 15: International Standards and Recommended Practices – Aeronautical Information Services

ISO 19103: Geographic information - Conceptual schema language

ISO 19107: Geographic information - Spatial schema

ISO 19108: Geographic information - Temporal schema

ISO 19109: Geographic information - Rules for application schema

ISO 19110: Geographic information - Feature cataloguing methodology

ISO 19111: Geographic information - Spatial referencing by coordinates

ISO 19112: Geographic information - Spatial referencing by geographic identifiers

ISO 19113: Geographic information - Quality principles

ISO 19114: Geographic information - Quality evaluation procedures

ISO 19115: Geographic information - Metadata

ISO 19118: Geographic information - Encoding

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