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Requirements for Aviation Metadata

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i. Abstract

This OGC Discussion Paper details the user requirements for metadata in the aviation domain. The requirements are at a high-level.

ii. Keywords

ogcdoc metadata aviation

iii. Preface

This paper was developed by OGC Member participants in the Aviation Domain Working Group as well as the OGC OWS Test Bed activities.

iv. Document terms and definitions

This document uses the standard terms defined in Subclause 5.3 of [OGC 05-008], which is based on the ISO/IEC Directives, Part 2. Rules for the structure and drafting of International Standards. In particular, the word “shall” (not “must”) is the verb form used to indicate a requirement to be strictly followed to conform to this standard.

v. Document contributor contact points

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vi. Forward

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Requirements for Aviation Metadata

1 Introduction

Metadata is data about data. It is used to provide, for example, the origin of the data and a point of contact concerning the data.

This paper details the user requirements for metadata in the aviation domain. The requirements are at a high-level.

Two main aviation specific sources for metadata requirements are used in this document. These are ICAO Annex 15 (13th Edition) and the Aeronautical Data Quality rules. These requirements have been supplemented with those arising from the INSPIRE directive [5] and by practical feedback from, for example, OGC Testbed #6.

This paper is a discussion paper. However, it is hoped that as it matures and gains acceptance that it will become a best practice.

2 Scope – Applicability

The discussion paper focuses on requirements for a dataset. It does not cover service metadata.

3 References

- [1] ICAO Annex 15 (13th Edition) – Aeronautical Information Services
- [2] The EU Aeronautical Data Quality Implementing Rule (COMMISSION REGULATION (EU) No 73/2010, 26 January 2010)
- [3] ISO 19115:2003 – Geographic Information – Metadata
- [4] ISO 19115:2003 – Geographic Information – Metadata – Technical Corrigendum
- [5] COMMISSION REGULATION (EC) No 1205/2008 - INSPIRE Metadata
- [6] Corrigendum to Commission Regulation (EC) No 1205/2008
- [7] INSPIRE Metadata Implementing Rules: Technical Guidelines

- [8] Final Draft Report, February 2006, Hydrographic Information Harmonization Working Group (HIHWG)
- [9] The FAA Whitepaper “Metadata Profile AIXM 5.1 Draft” (from March 26, 2010)
- [10] ISO 639-2:1998, Codes for the representation of names of languages — Part 2: Alpha-3 code
- [11] ISO 8601:2004 Data elements and interchange formats — Information interchange — Representation of dates and times
- [12] ISO 19136:2007 – Geography Markup Language

4 Interpretation

The following definitions shall apply:

- ‘resource’ means an asset or means that fulfils a requirement e.g. the aviation data set.
- ‘data set’ means identifiable collection of data
- ‘character string’ means the value domain of metadata elements expressed as a set of characters treated as a unit;
- ‘free text’ means the value domain of metadata elements expressed in one or more natural languages;
- ‘lineage’ means the history of a data set;
- ‘metadata element’ means a discrete unit of metadata in accordance with ISO 19115;
- ‘bounding box’ means the geographical box or rectangle that encloses the features contained in the resource.

5 Requirements

5.1 Identification

The following metadata elements shall be provided:

5.1.1 Resource Title

This is a characteristic, and often unique, name by which the resource is known.

The value domain of this metadata element is free text.

[Source: INSPIRE IR (1.1)]

5.1.2 Resource Abstract

This is a brief narrative summary of the content of the resource.

The value domain of this metadata element is free text.

[Source: INSPIRE IR (1.2)]

5.1.3 Resource Language

The language(s) used within the resource.

The value domain of this metadata element is limited to the languages defined in ISO 639-2.

[Source: INSPIRE IR (1.7)]

5.2 Classification of Aviation Data

The following metadata elements shall be provided:

5.2.1 Topic Category

The topic category is a high-level classification scheme to assist in the grouping of topic-based search of available aviation data resources.

The value domain of this metadata element is fixed to “transportation”.

[Source: INSPIRE IR (2.1)]

5.3 Geographic Location

The following metadata elements shall be provided:

5.3.1 Geographic Bounding Box

This is the extent of the resource in the geographic space, given as a bounding box. This requirement is in order to assist in searches of available aviation data resources.

The bounding box shall be expressed with westbound and eastbound longitudes, and southbound and northbound latitudes in decimal degrees with a precision of at least two decimals.

[Source: OWS-6, INSPIRE IR (4.1), Annex 15 (Chapter 10)]

5.3.2 Spatial Reference System

This describes the spatial reference system used throughout the data set.

This shall include:

- The earth reference model used in the data set;
- The coordinate system used in the data set.

[Source: ADQ (Annex 1, Part C, (f))]

5.4 Temporal Reference

This metadata element addresses the requirement for aviation data sets to include time specific data. At least one of the metadata elements referred to in points 5.4.1 to 5.4.5 shall be provided.

In addition, the metadata element in 5.4.5 should be provided where applicable.

The value domain of the metadata elements referred to in points 5.4.1 to 5.4.5 is a set of dates. Each date shall refer to a temporal reference system and shall be expressed in a form compatible with that system. The default reference system shall be the Gregorian calendar, with dates expressed in accordance with ISO 8601.

5.4.1 Temporal Extent

The temporal extent defines the time period covered by the content of the resource. This time period may be expressed as any of the following:

- An individual date;
- An interval of dates expressed through the starting date and end date of the interval;
- A mix of individual dates and intervals of dates.

[Source: OWS-6, INSPIRE IR (5.1)]

5.4.2 Date of Publication

This is the date of publication of the resource when available, or the date of entry into force. There may be more than one date of publication.

[Source: ADQ (Annex 1, Part C, (e)), INSPIRE IR (5.2)]

5.4.3 Date of Last Revision

This is the date of the last revision of the resource, if the resource has been revised. There shall not be more than one date of last revision.

[Source: INSPIRE IR (5.3)]

5.4.4 Date of Creation

This is the date of creation of the resource. There shall not be more than one date of creation.

[Source: INSPIRE IR (5.4)]

5.4.5 Temporal Reference System

ICAO Annex 15 stipulates: “For international civil aviation, the Gregorian calendar and Coordinated Universal Time (UTC) shall be used as the temporal reference system”

When a different temporal reference system is used for some applications, the metadata associated with the data set, shall include a description of that system.

[Source: ICAO Annex 15 (13th Edition) (3.7.3)]

5.5 Quality and Validity

This metadata element addresses the need from ICAO Annex 15 (13th Edition) that metadata be “collected for aeronautical data processes and exchange points... throughout the aeronautical information data chain”. The following metadata elements shall be used to satisfy the need.

5.5.1 Lineage

This is a record on the process history and/or overall quality of the aviation data set. Where appropriate it may include a statement whether or not the data set has been validated or quality assured.

In particular this metadata element shall record:

- The name of the organization or entity performing the function;
- The function performed. See section 7.1 for the options; and
- The date and time of operation.

[Source: ICAO Annex 15 (13th Edition) (3.8), ADQ (Annex 1, Part C, (b), (c), (d), (h)), INSPIRE IR (6.1)]

5.5.2 Accuracy of Numerical Data

The following metadata elements shall be recorded for numerical data:

- The statistical accuracy of the measurement or calculation technique used;
- The resolution;
- The confidence level as required by the relevant ICAO standards.

[Source: ADQ (Annex 1, Part C, (g)), ICAO Annex 15 (13th Edition) (3.2)]

5.5.3 Cyclic Redundancy Check

Electronic aeronautical data sets shall be protected by the inclusion in the data sets of a 32-bit cyclic redundancy check (CRC) implemented by the application dealing with the data sets.

[Source: ICAO Annex 15 (13th Edition) (3.2.12)]

5.6 Constraints Related to Access and Use

A constraint related to access and use shall be either or both of the following:

- A set of conditions applying to access and use;
- A set of limitations on public access.

5.6.1 Conditions Applying to Access and Use

This metadata element defines the conditions for access and use of the aviation data set and, where applicable, corresponding fees.

The value domain of this metadata element is free text.

This metadata element shall also provide information on any fees necessary to access and use the resource, if applicable, or refer to a uniform resource locator (URL) where information on fees is available.

[Source: ADQ (Annex 1, Part C, (i)), INSPIRE IR (8.1)]

5.6.2 Limitations on Public Access

This metadata element shall provide information on any limitation on public access to the aviation resource and the reasons for them.

The value domain of this metadata element is free text.

[Source: ADQ (Annex 1, Part C, (i)), INSPIRE IR (8.2)]

5.7 Organizations Responsible for the Establishment, Management, Maintenance and Distribution of Aviation Data Sets

The following metadata elements shall be provided:

5.7.1 Responsible Party

This is the description of the organization responsible for the establishment, management, maintenance and distribution of the resource.

The description shall include:

- The name of the organization as free text;
- A contact e-mail address as a character string.

[Source: ADQ (Annex 1, Part C, (a)), INSPIRE IR (9.1)]

5.7.2 Responsible Party Role

This is the role of the responsible organization.

The value domain of this element is defined in 7.2.

[Source: ADQ (Annex 1, Part C, (a)), INSPIRE IR (9.2)]

5.8 Metadata on Metadata

The following metadata elements shall be provided:

5.8.1 Metadata Point of Contact

This is the description of the organization responsible for the creation and maintenance of the metadata.

The description shall include:

- The name of the organization as free text;
- A contact e-mail address as a character string.

[Source: INSPIRE IR (10.1)]

5.8.2 Metadata Date

The date which specifies when the metadata record was created or updated.

The date shall be expressed in conformity with ISO 8601

[Source: INSPIRE IR (10.2)]

5.8.3 Metadata Language

This is the language in which the metadata elements are expressed.

The value domain of this metadata element is limited to the languages defined in ISO 639-2.

[Source: INSPIRE IR (10.3)]

6 Instructions on multiplicity and conditions of the metadata elements

The tables present the following information:

- The first column contains the reference to the paragraph in Part 5 defining the metadata element or group of metadata elements;
- The second column contains the name of the metadata element or group of metadata elements;
- The third column specifies the multiplicity of a metadata element. The expression of the multiplicity follows the unified modelling language (UML) notation for multiplicity, in which:
 - 1 means that there shall be only one instance of this metadata element in a result set;
 - 1..* means that there shall be at least one instance of this element in a result set;
 - 0..1 indicates that the presence of the metadata element in a result set is conditional but can occur only once;
 - 0..* indicates that the presence of the metadata element in a result set is conditional but the metadata element may occur once or more,
 - when the multiplicity is 0..1 or 0..*, the condition defines when the metadata elements is mandated;
- The fourth column contains a conditional statement if the multiplicity of the element does not apply to all types of resources. All elements are mandatory in other circumstances.

Ref	Metadata Elements	Multiplicity	Conditions
5.1.1	Resource Title	1	
5.1.2	Resource Abstract	1	
5.1.3	Resource Language	0..*	Mandatory if the resource includes textual information
5.2.1	Topic Category	1	
5.3.1	Geographic Bounding Box	1..*	
5.3.2	Spatial Reference System	0..1	Mandatory if not contained as part of the data itself

5.4	Temporal Reference	1..*	At least one of 5.4.1, 5.4.2, 5.4.3 and 5.4.4 shall be present.
5.4.5	Temporal Reference System	0..1	Mandatory if a reference system other than the Gregorian calendar and Coordinated Universal Time (UTC) is used.
5.5.1	Lineage	1	
5.5.2	Accuracy of Numerical Data	1	
5.5.3	Cyclic Redundancy Check	1	
5.6.1	Conditions Applying to Access and Use	0..*	Mandatory only if conditions on access or use apply
5.6.2	Limitations on Public Access	0..*	Mandatory only if limitations exist
5.7.1	Responsible Party	1..*	
5.7.2	Responsible Party Role	1..*	
5.8.1	Metadata Point of Contact	1..*	
5.8.2	Metadata Date	1	
5.8.3	Metadata Language	1	

7 Value Domains

7.1 Functions Performed

ICAO Annex 15 (13th Edition) specifies the following functions:

- Creation. This shall be interpreted as the "origination" of the data.
- Publication. This shall be interpreted as the "provision" of the data.
- Revision. This shall be interpreted as the "manipulation" of the data.

7.2 Responsible Party Role

The following list gives the possible roles for the responsible party:

- Resource Provider (resourceProvider). Party that supplies the resource.

- Custodian (custodian). Party that accepts accountability and responsibility for the data and ensures appropriate care and maintenance of the resource.
- Owner (owner). Party that owns the resource.
- User (user). Party who uses the resource.
- Distributor (distributor). Party who distributes the resource.
- Originator (originator). Party who created the resource
- Point of Contact (pointOfContact). Party who can be contacted for acquiring knowledge about or acquisition of the resource.
- Principal Investigator (principalInvestigator). Key party responsible for gathering information and conducting research.
- Processor (processor). Party who has processed the data in a manner such that the resource has been modified.
- Publisher (publisher). Party who published the resource.
- Author (author). Party who authored the resource.

8 Means of conformance

The metadata may be large and therefore, it is often not desirable that it is contained in the same file as the data. There is nothing in these requirements to prevent the metadata being published as a separate file.

The requirements listed in this document are the core requirements. There is nothing to prevent the use of metadata elements not mentioned here in order to satisfy the needs of a particular application.

It is possible to add information in satisfaction of the requirements to the data itself. In particular, information concerning the spatial reference system used can be added to the data if the Geography Markup Language (GML) [12] is used to exchange data.

9 Open issues

Section 5.5.2 concerns the Accuracy of Numerical Data. The exact meaning of this is still to be clarified. In particular, the requirement related to “the resolution” is unclear. What exactly does it measure (is it the original resolution of the measurement)?

The accuracy of measurements can be part of the data itself in some cases. The confidence level could default to the ICAO standards e.g. 95% or 90%.

Annex A - Matrix of Requirements to Source

The following table maps the requirement to the source:

Requirement/Source	Annex 15	ADQ	INSPIRE IR	OWS-6
5.1.1 Resource Title				
5.1.2 Resource Abstract				
5.1.3 Resource Language				
5.2.1 Topic Category				
5.3.1 Geographic Bounding Box				
5.3.2 Spatial Reference System				
5.4.1 Temporal Extent				
5.4.2 Date of Publication				
5.4.3 Date of Last Revision				
5.4.4 Date of Creation				
5.4.5 Temporal Reference System				
5.5.1 Lineage				
5.5.2 Accuracy of Numerical Data				
5.5.3 Cyclic Redundancy Check				
5.6.1 Conditions Applying to Access and Use				
5.6.2 Limitations on Public Access				
5.7.1 Responsible Party				
5.7.2 Responsible Party Role				
5.8.1 Metadata Point of Contact				

5.8.2 Metadata Date				
5.8.3 Metadata Language				