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UAS traffic management (UTM) —

Part 7: Data model for spatial data

Gestion du trafic des aéronefs sans pilote (UTM) —

Partie 7: Modèle de données pour les données spatiales

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Foreword

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This document was prepared by Technical Committee, ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 16, *Unmanned aircraft systems*.

A list of all parts in the ISO 23629 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

In order to enable UAS (unmanned aircraft systems) to operate safely, there is a need to define the data model that is related to various spatial information for common use between the UAS operators and the UAS traffic management (UTM) system. Existing standards regarding spatial data for safely operating UAS including static data and dynamic data do not exist, whereas efforts are underway to establish related standards on the part of ASTM and EUROCAE.

This document can be used as a reference model. Implementations of this document can lead to cost reductions in maintenance/expansion for application developers as well as compilation/maintenance of map data for map providers.

UAS traffic management (UTM) —

Part 7:
Data model for spatial data

1 Scope

This document specifies the data model that is related to various spatial information for common use between the UAS service provider and the system for operation control, e.g. UTM. This document specifies the names of the items for the data model, while the communication architecture and responsibilities of actors to define the items are not included.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 19157, *Geographic information — Data quality*

ISO 21384-4, *Unmanned aircraft systems — Part 4: Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21384-4 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
aerodrome
defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft

[SOURCE: ICAO/Annex 2]

3.2
CNS
communications, navigation, and surveillance systems, employing digital technologies, including satellite systems together with various levels of automation

[SOURCE: ICAO Doc. 9750]

3.3
time
mark attributed to an instant or a time interval on a specified time scale

Note 1 to entry: The representation rules are defined in the ISO 8601 series.

[SOURCE: ISO 8601-1:2019, 3.1.1.2, modified — The original notes to entry have been removed; a new note 1 to entry has been added.]

3.4
elevation
vertical distance of a point or a level, on or affixed to the surface of the earth, measured from mean sea level

[SOURCE: ICAO/Annex 4]

3.5
flight route
specified route designed for channelling the flow of traffic as necessary for the provision of *UTM* (3.11)

3.6
geo-limitation
entity that represents area surrounded by virtual boundary lines in the real world

3.7
geoid undulation
height of the geoid relative to a given ellipsoid of reference

3.8
height above ellipsoid
vertical distance of a point or a level, on or affixed to the surface of the earth, measured from World Geodetic System 1984 (WGS 84) ellipsoid

3.9
shape
horizontal projection on earth of a given object

3.10
magnetic declination
angle on the horizontal plane between magnetic north and true north

3.11
UAS traffic management
UTM
set of traffic management and air navigation services aiming at safe, secure and efficient integration of multiple manned and unmanned aircraft flying inside the respective designated operational coverage of each service

4 Data model

4.1 Overall data model

Overall data model shall consist of four packages: ground map package, obstacle data package, virtual data package, dynamic data package. Figure 1 shows the overall data model. For examples of information, see Annex A. For use cases, see Annex B.

An overall, data quality management system shall prove the data quality in accordance with ISO 19157.

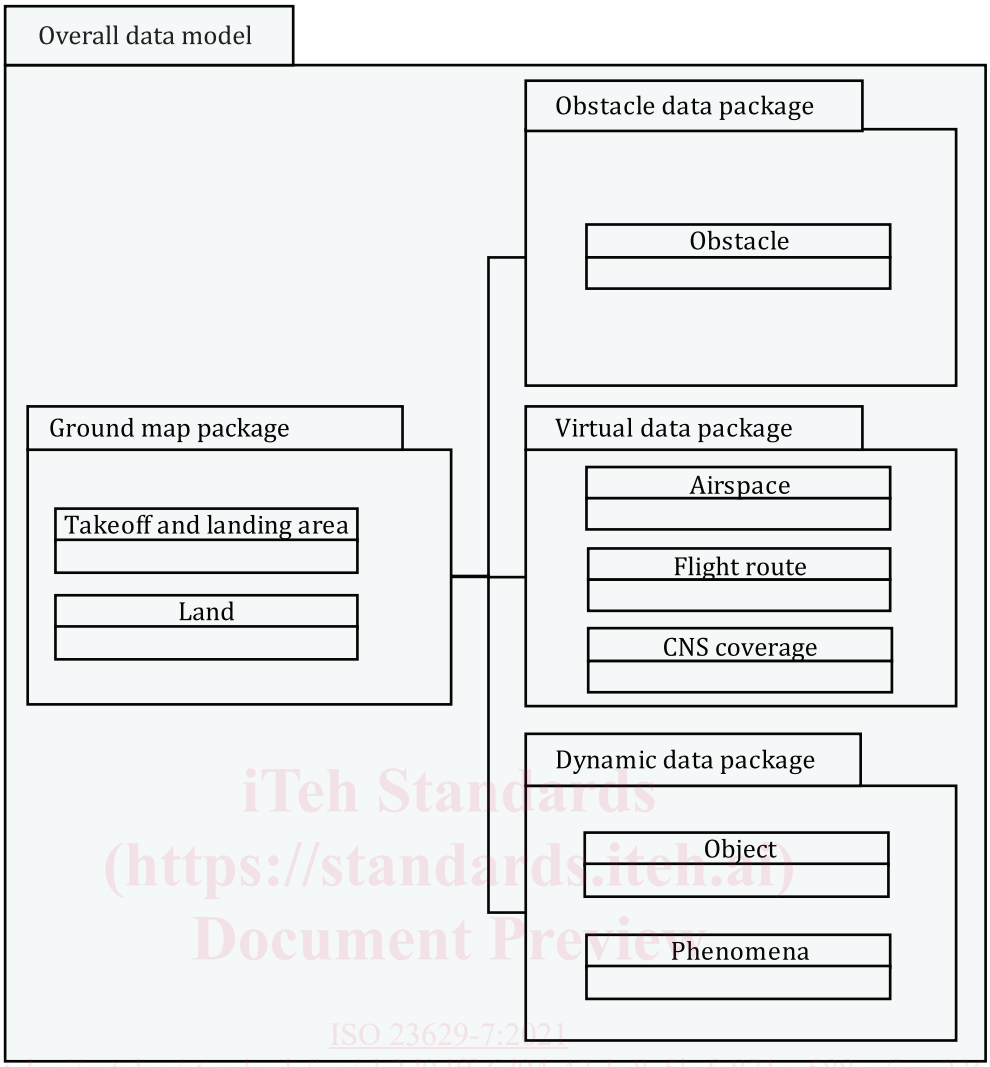

Figure 1 — Overall data model

4.2 Ground map package

4.2.1 Overview

Ground map package contains data that are defined as “geographical surface areas designed for specific activities”. Ground map package shall as a minimum contain two entities: takeoff and landing areas and land.

4.2.2 Attributes of takeoff and landing area

Takeoff and landing area is an entity that represents the area designated for either takeoff or landing of a UA (unmanned aircraft) in the real world. Table 1 summarizes minimum attributes of takeoff and landing area. Magnetic declination changes over time, and it may be updated as needed. Takeoff and landing area may include vertiports using the elements of conditions for operation and resources.

Table 1 — Attributes of takeoff and landing area

Attribute	Description
Identifier	Information for identifying the entity
Generate time	Information indicating the time the entity was generated
Disappearance time	Information indicating the time the entity will be disappeared, if projected
Available time interval	Information indicating the time interval the area is available
Elevation	Information indicating the elevation
Geoid undulation at elevation	Information indicating the geoid undulation at elevation
Time zone	Information indicating the time zone
Magnetic declination	Information indicating the magnetic declination
Shape	Information indicating the shape type and boundaries data (e.g. a group of coordinates of control points for polygon or centre point with radius) of the entity
Location	Information indicating the centroid of the entity in terms of latitudes and longitudes
Administration contact details	Information indicating the entity's administration contact details (e.g. administration's name, address, telephone)
Conditions for operation	Information indicating the conditions for operation (e.g. weather conditions, aircraft performance, operation procedures), either generally applicable to all operations, or limited to specific operations
Resources	Information indicating the equipment of the entity (e.g. energy supply, repairment, on-site staff)
Availability of emergency landing areas	Information indicating availability of emergency landing areas including dimensions and operating conditions, if any

4.2.3 Attributes of land

Land is an entity that represents artificially divided areas for specific activities in the real world. Table 2 lists minimum attributes of land. Magnetic declination changes over time, and it may be updated as needed.

Table 2 — Attributes of land

Attribute	Description
Identifier	Information for identifying the entity
Generate time	Information indicating the time the entity was generated
Disappearance time	Information indicating the time the entity will be disappeared, if projected
Elevation	Information indicating the elevation
Geoid undulation at elevation	Information indicating the geoid undulation at elevation
Time zone	Information indicating the time zone
Magnetic declination	Information indicating the magnetic declination
Shape	Information indicating the shape type and boundaries data (e.g. a group of coordinates of control points for polygon or centre point with radius) of the entity
Location	Information indicating the centroid of the entity in terms of latitudes and longitudes
Availability of emergency landing areas	Information indicating availability of emergency landing areas including dimensions and operating conditions, if any
Type of land	Information indicating the type of land (e.g. farmland, road)

4.3 Obstacle data package

4.3.1 Overview

Obstacle data package shall contain data that are defined as “tangible objects having a temporarily or permanently fixed location in the real world and pose a potential hazard to surface or air traffic of aircraft”. Obstacle data package shall as a minimum contain two entities: static and temporal obstacle.

4.3.2 Attributes of static obstacle

Static obstacle can be used for buildings, pylons, trees, etc. Table 3 summarizes minimum attributes of static obstacle.

Table 3 — Attributes of static obstacle

Attribute	Description
Identifier	Information for identifying the entity
Generate time	Information indicating the time the entity was generated
Disappearance time	Information indicating the time the entity will be disappeared, if projected
Height	Information indicating the height of the entity’s maximum vertical extent measured from a specified datum (specified in type of height)
Type of height	e.g. height above ellipsoid, height above mean sea level
Shape	Information indicating the shape type and boundaries data (e.g. a group of coordinates of control points for polygon or centre point with radius) of the entity
Location	Information indicating the centroid of the entity in terms of latitudes and longitudes
Type of obstacle	Information indicating the type of obstacle (e.g. building, tower, pole, antenna)

4.3.3 Attributes of temporal obstacle

Temporal obstacle can be used for short-term erections or for modifications to a static obstacle such as scaffolding. Table 4 summarizes minimum attributes of temporal obstacle.

Table 4 — Attributes of temporal obstacle

Attribute	Description
Identifier	Information for identifying the entity
Generate time	Information indicating the time the entity was generated
Disappearance time	Information indicating the time the entity will be disappeared, if projected
Height	Information indicating the height of the entity’s maximum vertical extent measured from a specified datum (specified in type of height)
Type of height	e.g. height above ellipsoid, height above mean sea level
Shape	Information indicating the shape type and boundaries data (e.g. a group of coordinates of control points for polygon or centre point with radius) of the entity
Location	Information indicating the centroid of the entity in terms of latitudes and longitudes
Type of obstacle	Information indicating the type of obstacle (e.g. scaffolding, construction equipment)