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ATIEC 2021

15 Sep 2021

AIXM

Implementation and evolution

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EUROCONTROL

ATIEC 2019

Digital data services in the ICAO AIS context

5.3 Digital data sets

5.3.1 General

5.3.1.1 Digital data shall be in the form of the following data sets:

- a) AIP data set;
- b) terrain data sets;
- c) obstacle data sets;
- d) aerodrome mapping data sets; and
- e) instrument flight procedure data sets.

Date: 23 September 2019

Aviation Information World – Forecasting the Future





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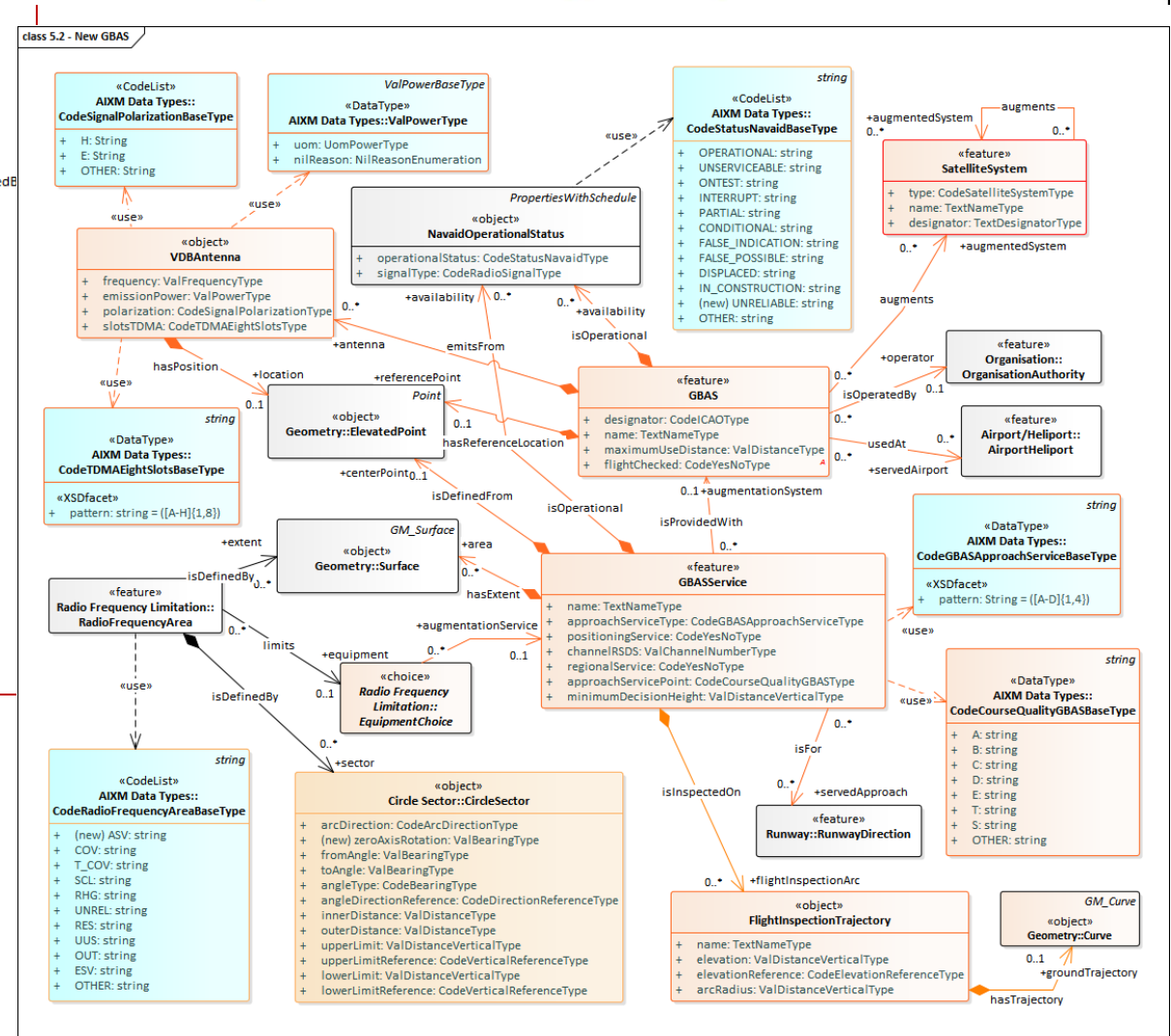
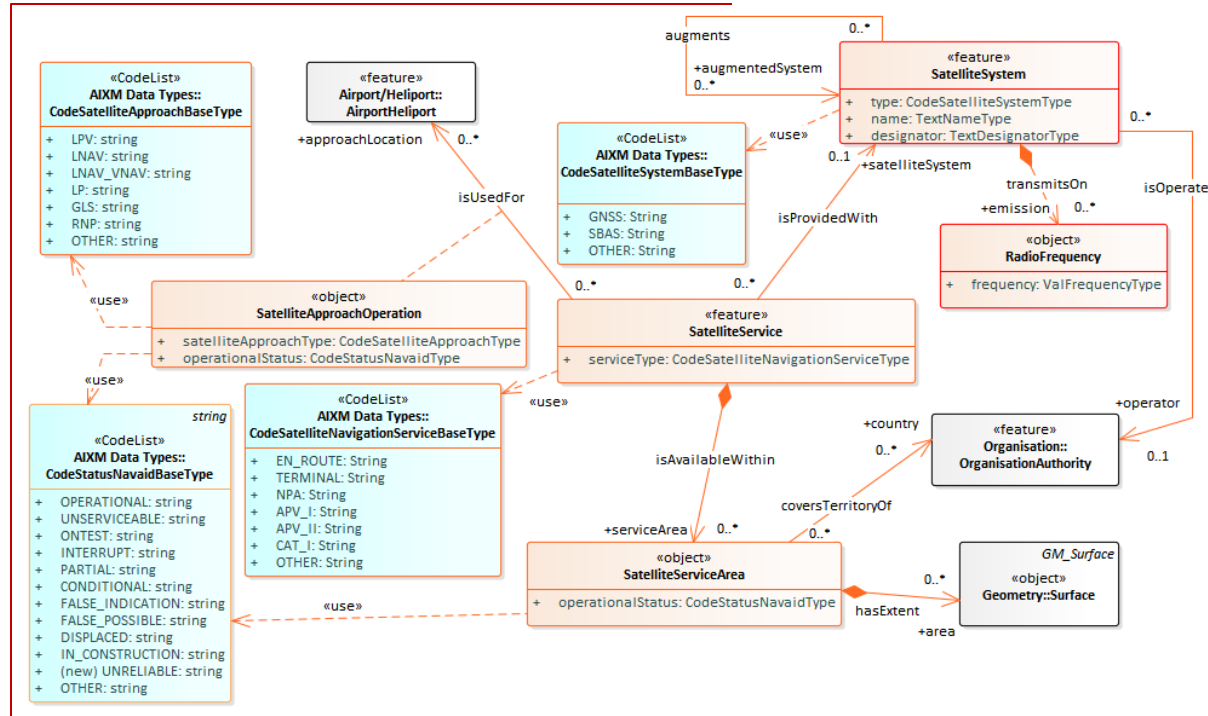
- AIXM Evolution



- AIXM implementation (specifications)
 - ICAO Digital Data Sets coding guidelines
 - Data Set validation services (business rules)
 - Digital NOTAM (2.0)
 - Digital data services

ID:	AIXM-467
target version:	AIXM 5.2
version:	0.2
last updated:	13 SEP 2021
status:	DRAFT

Add classes and properties necessary for Satellite Navigation Systems





Issue Statistics: AIXM 5.2 - Change Proposals (C... ...

Components	Count	Percentage
Aerial Refuelling	1	1%
Aircraft and Flight	6	9%
AirportHeliport	20	30%
Airspace	2	3%
Nav aids	3	4%
Obstacle	4	6%
Points	3	4%
Procedure	20	30%
Routes	9	13%
Schedules	2	3%
Service	3	4%
No component	10	15%
Total	67	

Transversal Topics

- AIXM-142 Correct association cardinalities
- AIXM-337 Design standard extended to additional features
- AIXM-343 AIXM version naming policy
- AIXM-391 Allow lower case in names
- AIXM-400 Forward-backward data mapping strategy
- AIXM-404 Add <<object>> persistent identifiers
- AIXM-419 Correct multiplicity of multi-occurring <<choice>> classes
- AIXM-423 Definitions corrections and improvements (AIRM alignment)
- AIXM-430 Aircraft category instead of type
- AIXM-432 Remove decimals limitation on vertical distances
- additional values in codelists
 - AIXM-341 Navigation equipment capability additional values
 - AIXM-407 Additional value for flight status
 - AIXM-425 Add support for start/end twilight

Routes

- AIXM-428 Multiple MEA values for RouteSegment
- AIXM-433 Route availability
- AIXM-435 Route segment reference to cardinal directions

Airspace

- AIXM-401 Use of term UA(S) instead of UAV
- AIXM-414 Add name property to AirspaceVolume

Nav aids/Points

- AIXM-402 Add ICAO Country code to DesignatedPoint and Nav aid

Airport/Heliport

- AIXM-398 New aerodrome reference code for Runway
- AIXM-405 Allow more OrganisationAuthority associated with AirportHeliport
- AIXM-406 New association CheckpointINS to Aircraft Stand
- AIXM-408 Additional visual slope indicator position attributes
- AIXM-409 Runway Safety-Related Lighting and Marking Changes
- AIXM-412 Add possibility to specify a timezone for airports
- AIXM-413 Additional taxi holding position property

Obstacles

- AIXM-322 Obstacle visual marking new property
- AIXM-399 Obstacle name, location and designator

ICAO Digital AIS Data Sets – AIXM coding rules

Topic	(Eurocontrol) Specification	Guidance
<i>Digital AIP Data Set</i>	End 2021 – start formal review	Available
<i>Digital Obstacle Data Set</i>	End 2021 – start formal review	Partially available
<i>Airport Mapping Data Set</i>	-	Available
<i>Instrument Flight Procedures Data Set</i>	Planned – 2022	Work in progress (in relation with AIXM 5.2)
<i>Terrain Data Sets</i>	-	-

AIXM Data set verification & validation

3.3 Aeronautical data and aeronautical information verification and validation

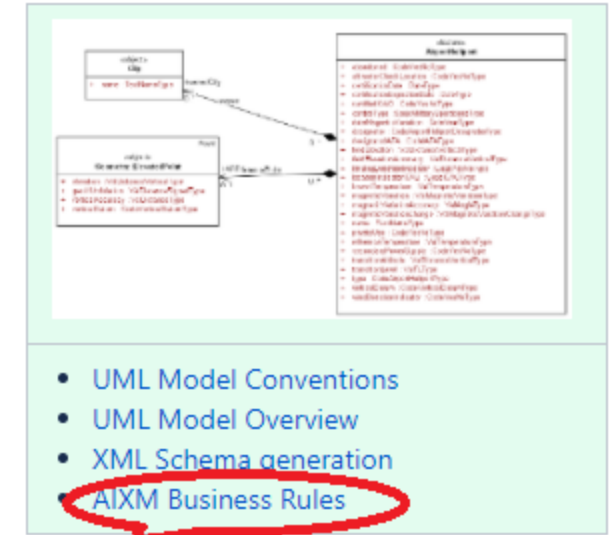
3.3.1 Material to be issued as part of an aeronautical information product shall be thoroughly checked before it is submitted to the AIS in order to ensure that all necessary information has been included and that it is correct in detail.

3.3.2 An AIS shall establish verification and validation procedures which ensure that upon receipt of aeronautical data and aeronautical information, quality requirements are met.

- AIXM XML Schema
 - 80% - ensures syntactic correctness of AIXM data
 - 20% - ensures that the data is fit for purpose
- AIXM Business Rules
 - 80 % - ensures that the data is fit for purpose
 - 20% - compensate limitations of the XML Schema

AIXM Business Rules

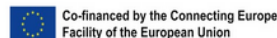
- It is prohibited that a VOR *has* assigned frequency value lower-than 108.0 and VOR *has* assigned frequency.uom value equal-to 'MHZ'
- It is prohibited that a AirportHeliport[1] *has* designator equal-to AirportHeliport[2].designator
- ...



AIXM Data Set verification services



AIXM Data Set Verification Service



Home Configuration

Validation

1) Please select a profile

Profiles

EAD

eEAD_Demo

Event

ICAO_AIP_DS

2) Please select a file to validate

Choose a file

Result

The data will be refreshed automatically.

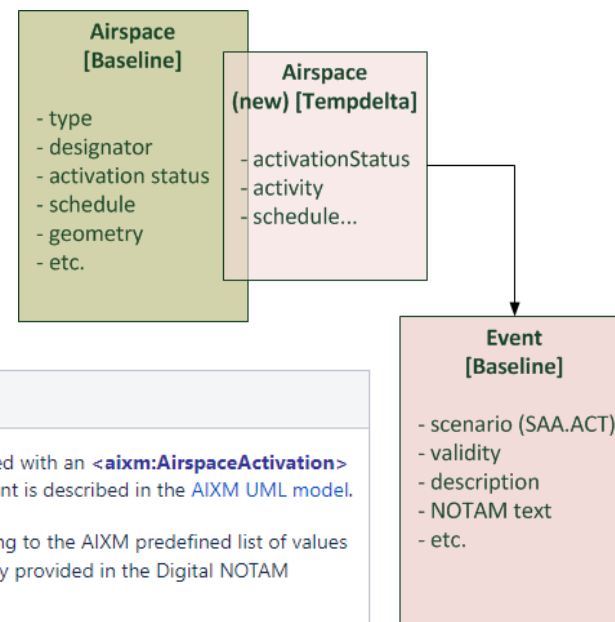
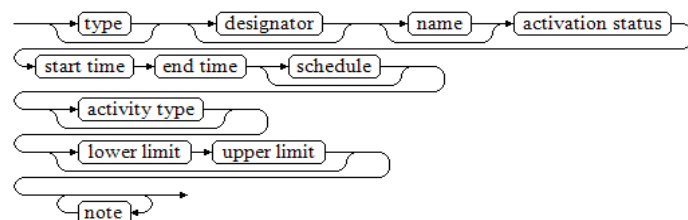
File Name	Status	Creation Date	Execution Time	Source	Result
1631086173210_1AB3F0_1AB3F1.xml	SUCCESS	2021-9-8 9:30:59	10 seconds		
1631085997404_1A5E00_Fail.xml	SUCCESS	2021-9-8 9:28:56	7 seconds		
1620745234412_1A5E00_Pass.xml	SUCCESS	2021-9-8 9:14:12	6 seconds		
1631085238132_DA048_DA04B_PASS.xml	QUEUED_FOR_VALIDATION	2021-9-8 9:14:12	not specified		
1620745221260_1A5E00_Fail.xml	QUEUED_FOR_VALIDATION	2021-9-8 9:12:1	not specified		
1631060649485_1AB3F0_1AB3F1.xml	SUCCESS	2021-9-8 2:25:24	5 seconds		
1631060561820_1AB3F0_1AB3F1.xml	SUCCESS	2021-9-8 2:22:59	2 seconds		
1631059939799_1AB3F0_1AB3F1.xml	SUCCESS	2021-9-8 2:12:34	4 seconds		
1631059812125_1AB3F0_1AB3F1.xml	SUCCESS	2021-9-8 2:11:0	12 seconds		
1631057549100_1AB3F0_1AB3F1.xml	SUCCESS	2021-9-8 2:7:59	60 seconds		

Rule ID	Rule definition	Rule category	Rule source	Rule profile	Ref. feature required	SBVR Rule status
VOR-0010	A VOR shall have a designator unless it is inapplicable	Compliance, Completeness	ICAO Doc 10066, 5.3.3.1.1, k	Minimum	NO	implemented 1B63B8
VOR-0011	The VOR.designator shall not be duplicated within 600 NM of the location of the VOR.	Compliance, Understandability	ICAO Annex 11, App. 2, 2.2.2	Extended	NO	
VOR-0020	A VOR shall have a name unless it is inapplicable	Compliance, Completeness	ICAO Doc 10066, 5.3.3.1.1, k	Minimum	NO	implemented 1B63B8
VOR-0030	A VOR shall have a frequency unless it is inapplicable	Compliance, Completeness	ICAO Doc 10066, 5.3.3.1.1, k	Minimum	NO	implemented 1B63B8
VOR-0040	A VOR shall have a location unless it is inapplicable	Compliance, Completeness	ICAO Doc 10066, 5.3.3.1.1, k	Minimum	NO	implemented 1B63B8
VOR-0050	A VOR shall have a zeroBearingIndication unless it is inapplicable	Compliance, Completeness	ICAO Doc 10066, 5.3.3.1.1, k	Minimum	NO	implemented 1B63B8
VOR-0031	The value of the VOR.frequency must be in the interval '108.000' to '117.975' 'MHz'.	Compliance, Credibility	ICAO Annex 10, Vol. 1, 3.3.2.1	Extended	NO	AIXM-5.1_RULE-104028 AIXM-5.1_RULE-1B7740 AIXM-5.1_RULE-1B7358

Digital NOTAM Specification (2.0)

[SAA.ACT] Published special activity area - activation

input



The airspace activation data

```

<aixm:activation>
5 <aixm:AirspaceActivation gml:id="ID_72">
  <aixm:annotation>
    <aixm:Note gml:id="ID_74">
      <aixm:purpose>REMARK</aixm:purpose>
      <aixm:translatedNote>
8      <aixm:LinguisticNote gml:id="ID_75">
        <aixm:note>In between firing periods, UAV unmanned aerial vehicle activity will take place.
        Prohibited for all manned military and civilian aircraft during UAV activity.
        More info can be obtained via EBMIZGZF or phone 0032 (0) 27524452.</aixm:note>
      </aixm:LinguisticNote>
      </aixm:translatedNote>
    </aixm:Note>
  </aixm:annotation>
  <aixm:activity>UAV</aixm:activity>
6 <aixm:status>ACTIVE</aixm:status>
  <aixm:levels>
7    <aixm:AirspaceLayer gml:id="ID_73">
      <aixm:upperLimit uom="OTHER">CEILING</aixm:upperLimit>
      <aixm:lowerLimit uom="OTHER">FLOOR</aixm:lowerLimit>
    </aixm:AirspaceLayer>
  </aixm:levels>
</aixm:AirspaceActivation>
</aixm:activation>
  
```

Legend

- ⑤ The data about the airspace activation is provided with an **<aixm:AirspaceActivation>** element. The complete list of properties of this element is described in the **AIXM UML model**.
- ⑥ The type of activity (coded value "UAV" according to the AIXM predefined list of values for this property) and the "ACTIVE" status are explicitly provided in the Digital NOTAM coding.
- ⑦ The **<aixm:levels>** complex element is mandatory and indicates the vertical extent of the activation. The special coded values "FLOOR" and "CEILING" indicate that the airspace is active between its predefined lower and upper limits, as contained in the baseline data. The explicit values are not copied here.
- ⑧ A Digital NOTAM may still contain free text annotations, for information that is intended for human operators and for which there is no predefined AIXM property. In this case, the annotation provides details about the activity and who to contact for further information. Note that it is possible to further qualify a free text annotation, using purpose ('REMARK' in this case) and indicating that it concerns a specific property of the feature. In this example, the first sentence ("In between firing periods...") would better be encoded as a separate annotation, associated with the **<aixm:activity>** property.

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<i>Terrain Data Sets</i>	-	-
<i>Digital NOTAM (edition 2.0)</i>	Planned - 2022	Partially available

AIXM Digital Data services

"5.1.1 Aeronautical information shall be provided in the form of aeronautical information products and associated services."

"5.4.1.3 Recommendation.— Global communication networks such as the Internet should, whenever practicable, be employed for the provision of aeronautical information products."

Data Set services

- Aeronautical ***Dataset Request*** Service Definition
- Aeronautical ***Dataset Publication*** Service Definition
- Aeronautical ***Dataset Notification*** Service Definition

Data feature services

- Aeronautical ***Data Feature Request*** Service

OGC Web Feature Service (***WFS***)

Eventually with the AIXM Temporal extension (***WFS-TE***)

Aeronautical Dataset Services

https://ext.eurocontrol.int/aixm_confluence/display/ADS/AeronauticalDataset+Services

QueryDatasetsRequest

Message which provides the criteria for querying datasets based on their metadata.

Property name	Type, Multiplicity	Definition
conformance	CodeEncodingStandardType [0..1]	Standard to which the data conforms.
datasetSeriesIdentifier	IdentifierType [0..1]	Identifier of the dataset series to which the dataset belongs.
datasetSeriesTitle	string [0..1]	Name of the dataset series. Pattern allowed using %...%.
form	CodeDatasetFormType [0..1]	Form of the data set.
geographicalExtent	Location [0..*]	Location defining the scope of the dataset.
identifier	IdentifierType [0..1]	Special unique identifier permanently assigned to a resource.
isAiracUpdate	boolean [0..1]	Indication that the data set has been updated according to the AIRAC System.
provider	string [0..1]	Name of the organisation that provided the dataset.
publicationDate	date [0..1]	Date at which the dataset became available.
startValidity	date [0..1]	Start of the validity period for the dataset.
subject	SubjectType [0..*]	Data subject covered by the dataset.
title	string [0..1]	Name by which the cited resource is known.

- *QueryDatasetsRequest*
- *QueryDatasetsReply*
- *QueryDatasetFilesRequest*
- *QueryDatasetFilesReply*
- *RetrieveDatasetFileRequest*
- *RetrieveDatasetFileReply*
- *RetrieveDPSFileRequest*
- *RetrieveDPSFileReply*

Aeronautical Dataset Services

https://ext.eurocontrol.int/aixm_confluence/display/ADS/AeronauticalDataset+Services

Aeronautical dataset

[Data set series](#) **[Data set](#)** [All data set files](#) [Manager](#)

Code:

Title (Pattern allowed '%'):

Dataset Series Code:

Type:

AIP Data Set

Update Type:

None

Encoding:

None

Airac Update:

None

Effective Date:

End valid Date:

Publication Date:

=

▼

Date

Countries:

Please enter at least the first character

Airports:

Please enter at least the first character

Airspaces:

Please enter at least the first character

Region Territories:

Please enter at least the first character

Reset

Apply

1



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Conclusion

- AIXM version 5.2 in finalisation
 - Planned release date – Q1 2022
- AIXM implementation
 - Coding rules
 - Verification & validation
 - Digital data Services

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