

Change ID: 5.1-14

Vertical structure - review

Summary

Because different parts of a vertical structure can have different values for material, type, designator, etc., it is proposed to move/copy some of the VerticalStructure properties into the VerticalStructurePart class. Also, it is proposed to add designator and radius attributes.

Background

AIXM gives the possibility to model complex VerticalStructures as an aggregation of parts. The [VerticalStructurePart](#) class holds the geometrical elements necessary for this purpose (horizontal projection and vertical extent). In order to keep the model simple, even an obstacle composed of a single volume would have its geometry modelled as a (unique) "part".

Rationale for the change

Vertical structure part attributes

The VerticalStructurePart has attributes that allow only for the geometry to be split into sub elements. However, some of the attributes of the VerticalStructure itself may also be applicable (and may have different values) for each part. This includes:

- type
- constructionStatus
- material
- marking details
- association with VerticalStructureLighting
- mobile
- frangible

It is therefore proposed to move these properties from the VerticalStructure in the VerticalStructurePart. In addition, the "type" attribute could have different values for the whole structure and for each of its parts. Therefore, it is proposed to have it in both classes.

This change will have no significant impact on the encoding of the vertical structures that are made of a single part (the largest majority). But it will enable a better modelling of those situations where each part has different values. The typical example is a long cable car, where each pylon and the wires are modelled as parts.

A consequence of this change is that the navigability of the association between VerticalStructurePart and VerticalStructureLighting needs to be reversed (because "VerticalStructurePart" is an object, therefore the VerticalStructureLighting feature cannot refer to it). However, if only this correction is applied, it will cause some difficulties when using the model because VerticalStructureLighting is "lower" than then VerticalStructure in the natural hierarchy of these features in the real world. The lighting cannot exist before or outside the existence of the vertical structure itself. Therefore, the complete solution is to also downgrade the VerticalStructureLighting, to no longer be a "feature". It should be just a complex property ("object") of the VerticalStructurePart. The information about the overall lighting of the vertical structure should go in the VerticalStructure class itself. In summary, this means:

- eliminate the class VerticalStructureLighting from the model and move the attributes lightingICAOSTandard and synchronisedLighting directly in the VerticalStructure class;
- associate the VerticalStructureLightingStatus directly with the VerticalStructure

- associate the LightElement directly with the VerticalStructurePart, which would allow to describe the individual lighting of each structure part.

Designator

Apart from the change discussed above, each part or the whole obstacle could have an alphanumeric designator, which is not supported by in the current model. Such designators are published in some national AIP for en-route (ENR 5.4) and airport obstacles (AD 2.10). It is therefore proposed to introduce a "designator" attribute in the VerticalStructurePart class.

Radius

The VerticalStructure has two attributes ("length" and "width") that are intended to provide an estimation of its horizontal size. For obstacles of circular shape or point obstacles with guy wires, it is also requested by ICAO Annex 15 to provide a "radius" attribute, which is missing from the current model. However, it shall be kept in mind that the width/length/radius are not intended to replace a proper encoding of the obstacle shape using the ElevatedPoint, ElevatedSurface or ElevatedCurve classes, as appropriate.

Change proposal details

Copy the following attribute from the VerticalStructure into VerticalStructurePart:

- type

Move the following attributes from the VerticalStructure into VerticalStructurePart:

- constructionStatus
- material
- markingPattern
- markingFirstColour
- markingSecondColour
- mobile
- frangible

Move the following attributes from VerticalStructureLighting into VerticalStructure:

- lightingICAOSTandard
- synchronisedLighting

Move the end of the association "isOperational" of VerticalStructureLightingStatus (introduced in Change Proposal 5.1-35) from VerticalStructureLighting to VerticalStructure and add "lighting" in the role name.

Move the end of the association "isComposedOf" of LightElement from VerticalStructureLighting to VerticalStructurePart. Change the association name into "isLighted" and the role name into "lighting".

Delete the VerticalStructureLighting class from the model.

Introduce a new attribute in VerticalStructurePart:

- designator = " *An alphanumeric code by which the structure is identified locally*", data type TextDesignatorType.

Introduce a new attribute in the VerticalStructure class:

- radius = " *The overall radius of an obstacle that has a relatively circular shape*", data type ValDistanceType.

The resulting model is presented in the diagram below:

