Change ID: 5.1-37

SurfaceContamination model update

Summary

It is proposed to introduce an inheritance structure for the SurfaceContamination class and also to modify some of its associations and attributes. This will improve the modelling of the current SNOWTAM information and will also facilitate the future model enhancements.

Background

The SurfaceContamination feature and the related classes model the information currently provided through SNOWTAM messages. It also supports more recent ICAO requirements with regard to the publication of ash contaminants.

Rationale for the change

Association with AirportHeliport

The current model does not have the possibility to indicate overall contamination status of an airport. However, many SNOWTAM messages indicate an overall contamination and give more precise information only for the runways and some taxiways/aprons. Therefore, it is proposed to introduce an association between SurfaceContamination and the AirportHeliport class.

Further Clearance Width

SNOWTAM messages may contain information about further clearance (length/width). There exists an attribute "furtherClearanceLength" in the RunwayContamination class. But there is no attribute for the further clearance width and it is proposed to introduce it.

Contamination layers

SNOWTAM messages can contain information about layers of contaminants (for example, snow over ice). This is not supported by the current model. Therefore, it is proposed to introduce a separate "SurfaceContaminationLayer" class, including the type of contaminant and a "layerOrder" attribute to indicate their order.

The "ElevatedSurface" should be associated with the layer because each layer could have a different extent. For example, the ice could be covering the whole runway, but a fresh layer of snow could cover just a part of it.

RunwaySection

The current model does not make a clear distinction between the contamination info provided for the whole runway and the contamination info provided for each runway third (which is the current SNOWTAM practice). This can result in different interpretations of the model, such as using a "SurfaceContamination" with no value for the RunwayContamination "section" attribute for the overall runway information. In order to clarify this aspect, a separate "RunwaySectionContamination" class is proposed to be introduced in the model.

Inheritance model

The Runway and the Taxiway contaminations can have specific attributes, which are modelled through association classes. But the model would be clearer if the SurfaceContamination was an "abstract" class and specialised classes were introduced for RunwayContamination, RunwayAreaContamination, TaxiwayContamination, AirportContamination, AircraftStandContamination, TaxiwayContamination and ApronContamination. This would also enable us, in future versions, to more easily add attributes that are applicable to each specific airport surface, in relation with its contamination.

The diagram below gives an overview of the modified surface contamination model, taking into consideration the changes proposed above.

Cleared side

In case of partial clearance, the current model allows to indicate the cleared side both for runways and taxiways. But for taxiways this information is not relevant for operations. In addition, it is hard to provide as taxiways do not have a "direction" (for runways, the "direction" is from the threshold with the lower designator number). Therefore, it is proposed to remove the attribute "clearedSide" from TaxiwayContamination.

Obscured lights side

In the current model, this attribute is included in the SurfaceContamination class. Thus, it is applicable to all surfaces (runway, taxiway, apron, etc.) However, this attribute only makes sense for runways, as for other surfaces it is not really possible to define a right/left side. Therefore, it is proposed to move this attribute into the RunwayContamination class.

Start of cleared portion for a runway

The current model allows indicating the cleared length in case of a partial clearance of a runway. But it is not possible to indicate where this cleared portion starts. This kind of information is also missing from the current SNOWTAM format. However, it seems important for pilots to know where this partially cleared area is actually located, because it has the same effect as a displaced threshold. Therefore, it is proposed to add a clearedLengthBegin attribute for this purpose.

No taxiway or apron available

The current SNOWTAM format allows the value "NO" in item N or R, to indicate that a taxiway or apron is not available for the associated runway. This information cannot be mapped into the current SurfaceContamination model. Therefore, it is proposed to add two dedicated attributes for this purpose in the RunwayContamination class:

- taxiwayAvailable (code yes/no) - indicating that there are available taxiways serving that runway;
- apronAvailable (code yes/no) - indicating that there are available aprons serving that runway.

Coverage percentage

Where the contamination is less than total, the percentage of the contaminated surface is important to be communicated. A contamination of less than 25% is typically not relevant for operations. The SNOWTAM format includes contamination percentage only as part of the free text T field. Therefore, it was not included in the AIXM 5.0 Surface Contamination model as a structured field.

However, this information is supported as a structured field by the METAR message, as part of the "state of the runway". Therefore, it is proposed to be include it as a specific "proportion" attribute in the SurfaceContamination class.

Observation date and time

The current model indicates that the data type of the "observationTime" and "nextObservationTime" attributes is TimeType. However, according to the Annex 15 specification, these fields shall contain month+date+hours +minutes. Therefore, it is necessary to express them as a full date & time data type in AIXM.

Change proposal details

Insert a new SurfaceContaminationLayer "object" in the model:

- definition = " *An operationally significant contaminant of homogeneous type such as snow, ice, slush, water, sand, etc., which is present on a large surface of the airport/heliport area.*"
- attributes:
  - layerOrder = " *The order of the layer, starting from the uppermost (value "1") towards the movement area surface, in case overlapping contaminants are present.*", data type No SequenceType.

Modify the SurfaceContamination class as follows:

- declare it "Abstract";
- move the attribute "type" into the new SurfaceContaminationLayer class;
- move the attribute "obscuredLightsSide" into the RunwayContamination class;
- insert a new attribute "proportion" = " *The percentage of the contaminated area from the overall extent of the surface*", data type ValPercentType;
- change the data type of the observationTime and nextObservationTime attributes into DateTimeType;
- move the association with ElevatedSurface from SurfaceContamination to the new SurfaceContaminationLayer class;
- insert a new association (aggregation by value) with class SurfaceContaminationLayer 0..*, hasLayers, role = "layer".

Insert a new data type ValPercentType class:

- definition " *A numerical value between 0.0 and 100, which designates a part or portion considered in its quantitative relation to the whole*"
- derived from "decimal"
- minInclusive = 0
- maxInclusive = 100

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- maxInclusive = 100

Insert a new data type DateTimeType class:

- definition " *A full date and time value*"

Modify the Ridge class:

- correct the definition of the "side" attribute to read " *The side of the runway where the deposited material is located*"
- correct definition of "distance" attribute to read " *Distance from the edge of the movement area*"
- correct the definition of the "depth" attribute to read " *Height of the ridges of deposited material*"

Insert a new RunwaySectionContamination "object" in the model:

- definition = " *The presence or removal of hazardous conditions due to snow, ice, slush, water, etc. on a section of the runway surface.*"
- inheritance association from SurfaceContamination;
- associated with Runway, role = "areaContaminant", multiplicity 0..*
- move into this class the attribute "section" from the RunwayContamination class

Modify the RunwayContamination class:

- remove the link with the association between Runway and SurfaceContamination
- insert an inheritance association from SurfaceContamination;
- changed definition = " *The presence or removal of hazardous conditions due to snow, ice, slush, water, etc. on the runway surface*."
- insert the following new attribute:
  - furtherClearanceWidth" =" *Width of runway that is expected to be cleared of contamination, if less than the total width*", data type ValDistanceType;
  - clearedLengthBegin = " *The distance from the threshold with the lowest designator number to the point where the cleared portion starts, in case of partial clearance*", data type ValDistanceType;
  - taxiwayAvailable = " *An indication whether there are cleared taxiways available serving that runway*", data type CodeYesNoType;
  - apronAvailable =" *An indication whether there are cleared aprons available serving that runway*", data type CodeYesNoType.
- move the end of the association with Runway from SurfaceContamination to RunwayContamination and change the role name into "overallContaminant"

Modify the TaxiwayContamination class:

- remove the link with the association between Taxiway and SurfaceContamination
- insert an inheritance association from SurfaceContamination;
- changed definition = " *The presence or removal of hazardous conditions due to snow, ice, slush, water, etc. on the taxiway surface*."
- move the end of the association with Taxiway from SurfaceContamination to TaxiwayContamination and change the role name into "contaminant"
- remove the clearedSide attribute

Insert a new TouchDownLiftOffContamination "object" class:

- definition = " *The presence or removal of hazardous conditions due to snow, ice, slush, water, etc. on the TLOF surface*."
- inheritance association from SurfaceContamination;
- move the end of the association with TouchDownLiftOff from SurfaceContamination to TouchDownLiftOffContamination

Insert a new ApronContamination "object" class:

- definition = " *The presence or removal of hazardous conditions due to snow, ice, slush, water, etc. on the Apron surface*."
- inheritance association from SurfaceContamination;
- move the end of the association with Apron from SurfaceContamination to ApronContamination

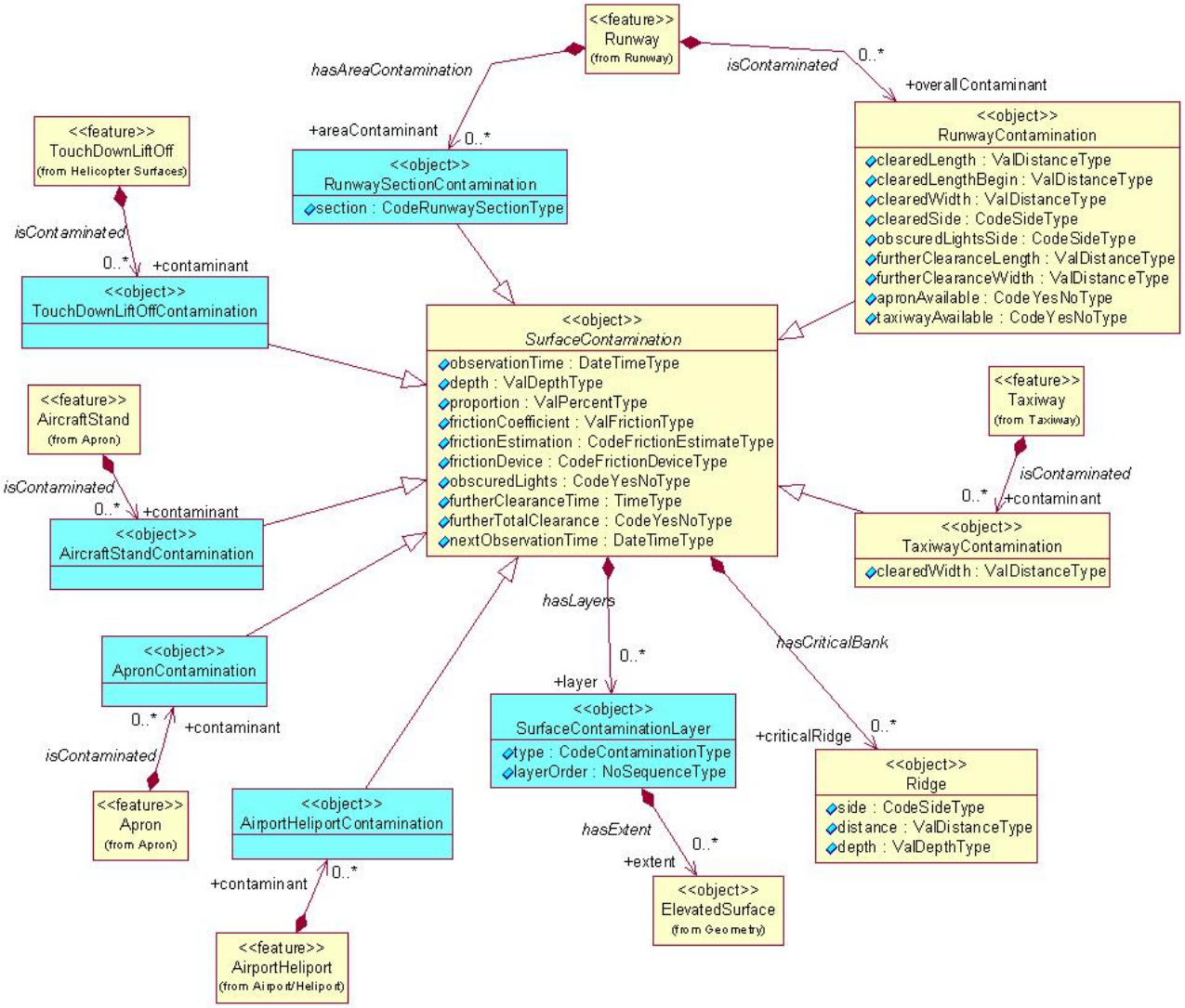
Insert a new AircraftStandContamination "object" class:

- definition = " *The presence or removal of hazardous conditions due to snow, ice, slush, water, etc. at an AircraftStand*."
- inheritance association from SurfaceContamination;
- move the end of the association with AircraftStand from SurfaceContamination to AircraftStandContamination

Insert a new Airport HeliportContamination "object" class:

- definition = " *The presence or removal of hazardous conditions due to snow, ice, slush, water, etc. on the airport surfaces*."
- inheritance association from SurfaceContamination;
- associated with AirportHeliport, role = " *contaminant*", multiplicity 0..*

The resulting model after the implementation of this change is shown in the diagram below: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RunwayContamination
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clearedLengthBegin : ValDistanceType
clearedWidth : ValDistanceType
clearedSide : CodeSideType
obscuredLightsSide : CodeSideType
furtherClearanceLength : ValDistanceType
furtherClearanceWidth : ValDistanceType
apronAvailable : CodeYesNoType
taxiwayAvailable : CodeYesNoType
<<feature>>
TouchDownLiftOff
(from Helicopter Surfaces)
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RunwaySectionContamination
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TouchDownLiftOffContamination
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SurfaceContamination
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depth : ValDepthType
proportion : ValPercentType
frictionCoefficient : ValFrictionType
frictionEstimation : CodeFrictionEstimateType
frictionDevice : CodeFrictionDeviceType
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ElevatedSurface
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(from Airport/Heliport)