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OGC® OWS-8 Report on Digital NOTAM Event Specification

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Preface

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This document is a deliverable for the OGC Web Services 8 (OWS-8) testbed activity. OWS testbeds are part of OGC's Interoperability Program, a global, hands-on and collaborative prototyping program designed to rapidly develop, test and deliver proven candidate standards or revisions to existing standards into OGC's Standards Program, where they are formalized for public release. In OGC's Interoperability Initiatives, international teams of technology providers work together to solve specific geoprocessing interoperability problems posed by the Initiative's sponsoring organizations. OGC Interoperability Initiatives include test beds, pilot projects, interoperability experiments and interoperability support services - all designed to encourage rapid development, testing, validation and adoption of OGC standards.

The OWS-8 sponsors are organizations seeking open standards for their interoperability requirements. After analyzing their requirements, the OGC Interoperability Team recommend to the sponsors that the content of the OWS-8 initiative be organized around the following threads:

* Observation Fusion
* Geosynchronization (Gsync)
* Cross-Community Interoperability (CCI)
* Aviation

More information about the OWS-8 testbed can be found at:

http://www.opengeospatial.org/standards/requests/74

OGC Document [11-139] “OWS-8 Summary Report” provides a summary of the OWS-8 testbed and is available for download:

https://portal.opengeospatial.org/files/?artifact_id=46176

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Contents

Page

OGC® OWS-8 Report on Digital NOTAM Event Specification

1 Introduction

1.1 Scope

This OGC® document describes the result work performed in OWS-8 on validating the Digital NOTAM Event Specification (DNES). A number of conceptual aspects are reviewed, issues identified and recommendations provided. Furthermore, the document describes the setup of the schematron rules that were created to automatically validate Digital NOTAMs. It also shows which normative statements of the DNES are covered by schematron tests.

1.2 Document contributor contact points

All questions regarding this document should be directed to the editor or the contributors:

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1.3 Revision history

Date	Release	Editor	Primary clauses modified	Description
08-25-2011	First Draft	Johannes Echterhoff	Initial version	First draft with initial content
09-01-2011	Improved Draft	Johannes Echterhoff / Matthes Rieke	Additional scenario coverage, open issues resolved	Draft for 3-Week-Rule of Boulder TC
09-09-2011	Updated draft for pre-final review	Johannes Echterhoff / Matthes Rieke	throughout	Draft created for review before finalization of the report
30-09-2011	1.0	Johannes Echterhoff / Matthes Rieke	throughout	final version

1.4 Future work

Improvements in this document are desirable to the following topics.

- **Validation of Text NOTAM Production Rules** - Validation of the information contained in textual NOTAMs via schematron rules is complex. Given the scope of the overall validation task at hand as well as the resources for OWS-8, the Text NOTAM production rules were not included in the validation efforts (except for some production rules from general sections). This task was deferred to future activities.
- **Validation of Digital NOTAM** - This document has identified a majority of the normative statements discovered from the DNES document, though not all scenarios are covered in completion. During development of the schematron rules, these normative statements were used as a guide - considering each statement and whether it's appropriate for a schematron rule to enforce. Not all normative statements have been considered and these have been marked with TBD.
- **Invocation of validation tools** - When considering the most appropriate way to invocate the validation tools for AIXM and Digital NOTAM in the context of OGC SDI recommendations resulted with the idea of wrapping the validation tool into a WPS process. This idea expanded to a WPS Application Profile that describes a set of processes for validating conformance of GML documents against a GML Application Schema. Considerations include:
    - A multiple process approach where the process name identifies the validation profile to use; e.g. validateAIXM, validateDNOTAM, valdiateCityGML. The WPS mechanisms then provide appropriate capabilities advertisement via the list of processes and using describeProcess.
    - Alternatively a single process approach that includes a parameter to identify the application schema (or validation profile) to apply during validation. More easily expandable and more likely supported in the existing approach to defining WPS Application Profiles where each process must be defined, but may also require a getSupportedValidationProfiles process, which seems to introduce unnecessary duplication of interface abstraction.
    - Potential process parameters:
        - URL of content to validate, examples include a GML document or WFS response.
        - An identifier to nominate the application schema to use for validation, as already discussed. Perhaps call this the Validation Profile. The WPS process will need to support the application schema, and decide what validation technology or technologies it will apply; XML Schema, Schematron, RelaxNG, custom validation to handle otherwise non-testable constraints.
        - Output format for validation results, if more than one is to be supported.

  - Define the response format of the validation result.
  - Include a schema only validation process. The server would not need prior knowledge of the schema as long as the schemas to apply can be derived from the XML file.
  - Include a schematron only validation process where the schematron file is provided by the caller. Could also provide RelaxNG, XML Schema and possibly other validation methods this way.
- **Enrichment of DNOTAM data** – In some cases the normative statements of the Digital NOTAM Event Specification presume the availability of information which is not part of a DNOTAM (e.g. checking against designators in BASELINE data). To process such rules a validation tool must provide a method for retrieving such information from an AIXM data store. This is closely related to the Event enrichment in the Event Architecture of OWS (see OGC 11-093, section 9.5.1). Some of the observed issues presumably also apply for enrichment regarding automatic validation. Hence, a general approach for dealing with dynamic features in web service architectures should be discussed.

1.5 Foreword

This document is a deliverable of the OGC Web Services (OWS) Initiative - Phase 8 (OWS-8). It describes the results of the conceptual and schematron rule based validation of the Digital NOTAM Event Specification (DNES). Various conceptual aspects were identified which need clarification and/or revision. Schematron rules were developed for a number of the DNES scenarios. This document contains coverage tables which document normative statements from the DNES and indicate which of them can be tested with existing schematron rules.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The Open Geospatial Consortium shall not be held responsible for identifying any or all such patent rights.

Recipients of this document are requested to submit, with their comments, notification of any relevant patent claims or other intellectual property rights of which they may be aware that might be infringed by any implementation of the standard set forth in this document, and to provide supporting documentation.

2 References

The following documents are referenced in this document. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the normative document referred to applies.

OWS-8 Engineering Reports:

- OGC 11-093, OWS-8 Aviation Architecture Engineering Report

Other OGC Documents:

- OGC 06-121r3, OpenGIS® Web Services Common Standard
- OGC 10-195, Requirements for Aviation Metadata
- OGC 10-196r1, Guidance on the Aviation Metadata Profile
- OGC 11-060, Use of GML in aeronautical data

Aviation specific documents:

- Digital NOTAM Event Specification, ed. 1.0 (Proposed Release)
- AIXM 5 Temporality Model ed. 1.0
- AIXM 5.1 Feature Identification and Reference - use of xlink:href and UUID

3 Abbreviated terms

ADVR	Automatic Data Validation Rule
AIS	Aeronautical Information Service
AIXM	Aeronautical Information Exchange Model
AIXM-TM	AIXM Temporality Model
ANSP	Air Navigation Service Provider
CRS	Coordinate Reference System
DNES	Digital NOTAM Event Specification
DNOTAM	Digital NOTAM
EAD	European AIS Database
EBNF	Extended Backus Naur Form
EPSG	European Petroleum Survey Group Geodesy
FAA	Federal Aviation Administration
GML	Geography Markup Language
HTTP	Hypertext Transfer Protocol
ICAO	International Civil Aviation Organization
ISO	International Organization for Standardization
NOTAM	Notice to Airmen
OGC	Open Geospatial Consortium
OPADD	Operating Procedures for AIS Dynamic Data
OWS	OGC Web Services
OWS-8	OWS Testbed Phase 8
SAA	Special Activity Airspace
SDI	Spatial Data Infrastructure
UML	Unified Modeling Language
URL	Uniform Resource Locator
WPS	Web Processing Service
WS-I	Web Services Interoperability Organization
XML	Extensible Markup Language
XPath	XML Path Language
XSL	Extensible Stylesheet Language

XSLT XSL Transformation

4 OWS-8 Report on Digital NOTAM Event overview

The specified OWS-8 Report on Digital NOTAM Event documents the results of the work performed in the OWS-8 Aviation thread on validating the Digital NOTAM Event Specification (DNES).

The DNES defines how information that is currently published through NOTAM messages shall be encoded in a harmonized way based upon AIXM 5.1.

Currently, a NOTAM is a simple but structured text note which is intended to be read by pilots, controllers and other operational personnel involved in flight operations. For example, a NOTAM can provide information about the activation of a certain airspace - which may require re-planning of a flight that was intended to pass through that airspace. In order to improve the exchange and use of the information conveyed via NOTAMs, the DNES defines the format of Digital NOTAMs (DNOTAM). These are intended for consumption by automated systems. In addition, the specification covers rules for handling specific event scenarios.

The DNES supports the provision of the currently used text NOTAM together with a DNOTAM. This facilitates the transition from text NOTAM to pure DNOTAM - a process that is expected to require years.

The current version of the DNES defines encoding rules that cover both general events but also events that are specific to certain scenarios. These scenarios were selected by the Digital NOTAM Event Specification Focus Group for the Increment 1 of the digital NOTAM implementation in Europe. These scenarios may be adapted and extended in the future. The current version of the DNES therefore shall be considered as guidance material, not as a normative specification. Nevertheless, the rules defined in the DNES are intended to ultimately achieve interoperability of systems that publish and receive DNOTAMs.

To achieve interoperability, the DNES is validated through implementations and general reviews by the community. One example is the work performed with respect to the European AIS Database (EAD). Another example is OWS-8.

Within the OWS-8 Aviation thread, the DNES was validated through:

- review of the conceptual aspects of DNOTAM design and usage rules
- creation of a schematron rule set for automatically testing DNOTAMs against the rules defined by the DNES.

The results of these validation efforts are documented in this report.

5 Validation Results - Conceptual Aspects

The following sections provide detailed information on the issues that were identified during the validation of the DNES.

5.1 Encoding of Geometries

5.1.1 Problem Statement and Description

Section 5.3 in the DNES defines how geometrical and geographical data is encoded in a DNOTAM - more specifically, how it is encoded in a text NOTAM. The encoding rules stated in section 5.3.2 describe the general patterns for encoding points, lines and polygons - with its various facets - while section 5.3.4 describes the actual text NOTAM production rules.

These patterns show that it is possible to encode a "Datum" other than WGS-84 (which is the default). The encoding of "Lat"/"Long" fields shall use the first/second value of a ".../gml:pos" element. The encoding of the "Datum" depends on the srsName attribute for the "*aixm:Point, aixm:ElevatedPoint, aixm:Curve, aixm:ElevatedCurve, aixm:Surface or aixm:ElevatedSurface concerned*".

A Coordinate Reference System (CRS) not only incorporates the datum but also defines the coordinate system that is being used, including the axis order. The "Use of GML in aeronautical data" document describes this in more detail. It recommends to use EPSG:4326 as the default CRS. EPSG:4326 uses WGS-84.

In GML, the CRS of a geometry is given via the value of its (explicitly given or derived) "srsName". Again, the "Use of GML in aeronautical data" provides further details.

The general encoding instructions in DNES section 5.3.2 and 5.3.4 should be revised because:

- They treat "Datum" equal to "CRS" although these are different - albeit related - concepts: "Datum" is used in the pattern diagrams and gets the value of the "srsName" attribute of a geometry.
- They assume that latitude/longitude is always given as the first/second value of a gml:pos although this depends on the CRS of the relevant geometry, and no further restriction is made regarding the values of the "srsName" of geometries that would require a (supposedly: ellipsoidal) coordinate system with "latitude" as first axis and "longitude" as second axis. Note that this would still allow for both two and three-dimensional CRS.
- They assume that the srsName attribute is encoded for the aixm:Point, aixm:Curve, or aixm:Surface concerned (and their elevated equivalents). The text is silent (at least in section 5.3.2; in section 5.3.4 the OGC document 11-060 is at least mentioned) about the fact that - as explained in the "Use of GML for

aeronautical data" document - a geometry without srsName derives its CRS from its closest ancestor that has an srsName. However, it is possible that no such ancestor exists, i.e. no ancestor has an srsName. This is possible because the srsName for all geometries of a feature can also be defined via the srsName of the gml:Envelope in the boundedBy element of that feature or the feature collection in which the feature is contained.

5.1.2 Available Options / Solutions

If the "Datum" field is actually intended to identify the complete CRS and not only the datum, then it should be renamed accordingly. Otherwise, clarification is needed in the encoding description for that field, in that the srsName of the geometry concerned is only used to identify the actual datum (like WGS-84) - and that the coordinate system (supposedly "ellipsoidal with latitude as first axis and longitude as second axis") is fixed.

As the "Datum" field is optional according to the templates, the default value should be mentioned. As stated in section 3 of the "Use for GML in aeronautical data" document, ICAO Annex 15 requires that all *"published aeronautical geographical coordinates (indicating latitude and longitude) shall be expressed in terms of the WGS-84 geodetic reference datum"*. So the DNES should note that this is the default.

If the "Datum" field actually is intended to identify the complete CRS (see previous paragraph) then the default value should be EPSG:4326, which is generally recommended as explained in the "Use for GML in aeronautical data" document.

If the encoding instructions for the "Lat" and "Long" fields are not revised, then clarification should be added to the "Datum" field that the value of the srsName is not allowed to identify a CRS that does not have an ellipsoidal coordinate system with "latitude" as first axis and "longitude" as second axis. Otherwise, the rules should be re-written to take the value of the relevant CRS into account. For example, the rule for encoding the "Lat" field could be "n-*th value of the gml:pos element,* n *being the ordinal of the "latitude" axis in the CRS that the geometry is provided in*".

The text - both in section 5.3.2 and 5.3.4 - that explains how the srsName value is provided for a geometry should be revised to just point to the "Use for GML in aeronautical data" document, which provides the required information in sufficient detail.

5.1.3 Conclusion and Recommendation

The "Datum" field should be renamed to "CRS" or equivalent. Text passages that mention "geographical datum" should be changed accordingly.

EPSG:4326 should be noted as the default value for that field, following the "Use for GML in aeronautical data" guidelines.

With respect to the conventions of axis order required by ArcByCenterPoint and the requirements from the aeronautical domain to have 0° "north" and angle values

increasing clockwise, it appears necessary to require that the srsName attribute only identifies CRSs with latitude as first axis and longitude as second axis.

5.2 Angle values

5.2.1 Problem Statement and Description

The encoding instructions for the start and end angle as written in the table of DNES section 5.3.2 require that a start angle has a value in the range of [0° ... 360°) and an end in the range of (0° ... 720°), the value of the end angle always being greater than that of the start angle.

This is different to the requirements concerning angle values as written in the "Use of GML in aeronautical data" document section 2.4.2 "Arc direction", which requires a value range of [-360° … 360°] for both start and end angle of a gml:ArcByCenterPoint and which allows the start angle to be bigger than the end angle to enable the provision of arc direction. No clarification is provided how these different definitions relate to each other.

The DNES states that the start angle is "*encoded as child gml:startAngle element of a gml:ArcByCentrePoint, eventually adjusted with the local magnetic declination or the station declination if the angle reference is not the True North.*"

This suggests that the textual encoding of a start angle can just use the value of gml:ArcByCenterPoint/gml:startAngle, which is not the case.

Section 5.3.4 defines how a gml:ArcByCenterPoint is decoded into a textual representation. Rather than providing the angle values, absolute positions are computed (or re-used) for the start and end of the arc. This approach is good. However, it does not match up with the approach written in section 5.3.2. The discrepancy should be solved.

5.2.2 Available Options / Solutions

If there is a specific requirement to use the value ranges for start and end angles in textual encodings as specified by the DNES section 5.3.2, then a clear formula how to convert from the angle values provided in a gml:ArcByCenterPoint should be provided. According to the actual text NOTAM production rules given in section 5.3.4, this does not seem to be the case. Therefore, the text in the according description fields of the table in DNES section 5.3.2 for start and end angle should be revised to be in line with the "Use of GML for aeronautical data" document.

5.2.3 Conclusion and Recommendation

Aligning the text in the according description fields of the table in DNES section 5.3.2 for start and end angle with the "Use of GML for aeronautical data" document is recommended. In fact, the requirements regarding angle value ranges should be exactly like in that document.

5.3 Specification and Usage of Conformance Targets

5.3.1 Problem Statement and Description

The DNES contains many normative statements. Many of them apply to an encoded dnotam:Event. However, some apply also to the data originator or publisher. Some of these statements can be tested with automated tools.

It is not always clear for which entity a given statement is relevant. This makes it more difficult for a data originator or developer of a DNOTAM validator tool to identify the statements that are relevant for him/her.

5.3.2 Available Options / Solutions

Some specifications in the IT domain clearly identify so called conformance targets to which normative statements in the specifications are unambiguously assigned. For example, the WS-I Basic Profile 2.0[1] defines conformance targets such as “Message”, “Receiver” and “Sender”.

The following extract from WS-I Basic Profile 2.0 section 2.1 explains the use of conformance targets in combination with requirements:

> “Requirement levels, using RFC2119 language (e.g., MUST, MAY, SHOULD) indicate the nature of the requirement and its impact on conformance. Each requirement is individually identified (e.g., R9999) for convenience.
>
> For example:
>
> *R1012 An **ENVELOPE** MUST be serialized using either UTF-8 or UTF-16 character encoding.* CORE TESTABLE BP1018
>
> This requirement is identified by "R1012", applies to the target ENVELOPE, and places a requirement upon envelopes.
>
> Each requirement statement contains exactly one requirement level keyword (e.g., "MUST") and one conformance target keyword (e.g., "MESSAGE"). The conformance target keyword appears in bold text (e.g. "MESSAGE"). Other conformance targets appearing in non-bold text are being used strictly for their definition and NOT as a conformance target. Additional text may be included to illuminate a requirement or group of requirements (e.g., rationale and examples); however, prose surrounding requirement statements must not be considered in determining conformance.”

As we can see, the requirements stated in WS-I Basic Profile clearly identify to which conformance target they apply. Rules are in place to ensure that requirements are unambiguous with respect to the target they apply to.

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[1] see http://ws-i.org/Profiles/BasicProfile-2.0-2010-11-09.html

In addition, we can see that requirements have an identifier which facilitates referring to specific requirements. They also have tags. The tag “CORE” in the example above is used to indicate that this requirement always applies for an ENVELOPE. Another value used by the WS-I Basic Profile is “HTTP-TRANSPORT”, indicating that a given requirement applies if HTTP is used for communication. Finally, the tag “TESTABLE” is used to indicate if automated tests exist with which the requirement can be checked (the other value would be “NOT_TESTABLE”) - this is comparable to the “rule coverage” in the tables of section 8 in this report. If a requirement is testable, then the last tag identifies the test(s) and also provides a link to the test.

The OGC recently also established a policy that requires new standards to also clearly identify conformance targets and the requirements that apply for them.

The DNES should adopt a similar approach, i.e. clearly list and describe the set of relevant conformance targets - for example “Event” and “Data Originator”, maybe also “Text NOTAM” - and ensure that each normative statement clearly identifies the conformance target that it applies to.

5.3.3 Conclusion and Recommendation

We recommend revising the DNES as described in the previous section. While the normative statements / requirements do not necessarily need to be identified as shown in the WS-I Basic Profile, they should at least explicitly name the relevant conformance target.

5.4 Request for Clarification

5.4.1 Container Format for Events

5.4.1.1 Problem Statement and Description

The DNES does not require a specific container format for encoding DNOTAM Event data. In many examples, however, AIXMBasicMessage is used to encode the data. Developers and users may thus be tempted to think that AIXMBasicMessage is the required container format. During a telcon the sponsors explained that even though AIXMBasicMessage is often used in examples other container formats are perfectly fine for transporting the relevant data. These container formats could for example carry application specific data, in addition to the DNOTAM Event data.

The lack of documentation regarding the container format for communicating a DNOTAM Event can cause confusion and can lead to developments that are based on false assumptions.

5.4.1.2 Available Options / Solutions

The DNES should explicitly state that DNOTAM Event data can be encoded using container formats other than AIXMBasicMessage so that this can be taken into account by developers and users.

5.4.1.3 Conclusion and Recommendation

To avoid confusion a note should be added to the DNES to clarify that the specification allows more than one container format. This note could be added in a section that describes the usage of DNOTAMs in communications between system entities. There are multiple aspects that could be described there, see sections 5.4.2 and 5.4.3.

5.4.2 Multiple Events per Message

5.4.2.1 Problem Statement and Description

The DNES does not seem to contain a requirement that a message only contains one dnotam:Event. The currently described scenarios suggest that only one Event is needed. Therefore, automatic validation rules (e.g. via schematron) may be developed based upon this constraint. However, if this constraint is not valid then such developments would be flawed.

5.4.2.2 Available Options / Solutions

The DNES should explicitly state if multiple dnotam:Events can be communicated in one message (e.g. an AIXMBasicMessage or other container used to transport the data) so that this can be taken into account by developers and users.

5.4.2.3 Conclusion and Recommendation

A clarification telcon with the sponsors revealed that for the current scenarios defined in the DNES one Event per message would in fact suffice. However, it was also said that in the future the DNES may define more complex scenarios where more than one Event may be included per message (e.g. having one Event referring to another). In addition, use cases like data synchronization between two system entities may be preferable.

Simple validation tools may benefit from a constraint that there is only one Event per message. Use cases that do not necessarily require validation - like the data synchronization use case - could then still work with multiple Events per message. However, the schematron rules developed during the testbed support multiple dnotam:Events per message.

To summarize, there does not seem to be a need to add a “one Event per message constraint” to the DNES. To avoid confusion a note should be added to the DNES to clarify that the specification allows more than one Event to be communicated in a single message. This note could be added in a section that describes the usage of DNOTAMs in

communications between system entities. There are multiple aspects that could be described there, see sections 5.4.1 and 5.4.3.

5.4.3 Message Members Unrelated to the Event

5.4.3.1 Problem Statement and Description

The DNES does not explicitly exclude messages that contain dnotam:Events from having members that are unrelated to the Event. This may cause confusion as DNOTAM developers and users may expect that a message containing dnotam:Event(s) is singly purposed.

5.4.3.2 Available Options / Solutions

If there is a reason for allowing a message containing dnotam:Event(s) to include information that is not directly related to the Event(s) then this should be explicitly described in the specification.

If there is no such reason, then an according constraint should be added in the specification to ensure that a message containing dnotam:Event(s) is singly purposed.

5.4.3.3 Conclusion and Recommendation

A telcon with the sponsors revealed that indeed there are reasons for allowing a message to contain information that is not directly related to dnotam:Event(s) contained in that message.

One such reason is that features which link to a dnotam:Event may also need to link (via xlink:href) to other features. It is not guaranteed that each AIXM system supports such linking via concrete external or abstract references as defined in the “Feature Identification and Reference” document. Instead, these systems may only support concrete local references within a message, which requires that referenced features by included in the message as well.

Another reason is that in some AIXM/DNOTAM applications feature Snapshots are included in the message to facilitate certain tasks, such as validation.

We thus recommend to add an explicit note to the DNES which explains that a message containing dnotam:Event(s) shall be expected to include information that is not directly related to the Event(s). Such a note could be added in a section that describes the usage of DNOTAMs in communications between system entities - see sections 5.4.1 and 5.4.2.

5.4.4 Availability of Static Data

5.4.4.1 Problem Statement and Description

Section 2.1 of the DNES states that "*a pre-requisite for any Digital NOTAM application is the availability of the corresponding static data in the form of AIXM 5.1 BASELINE TimeSlices.*"

According to the AIXM Temporality Model (AIXM-TM), it is possible that the static data is not fully provided by Baseline timeslices but also through Permdeltas for which no new Baseline was established:

"*Conceptually, there exists a direct dependence between PERMDELTA and BASELINE Time Slices. However, this does not mean that the BASELINE Time Slice needs to be effectively instantiated after each PERMDELTA. In an implementation, it is possible, for example, to 'accumulate' PERMDELTA Time Slices. The instantiation of a new BASELINE might occur, for example, after each third PERMDELTA affecting a feature.*" (AIXM Temporality Model, p. 10)

The text in DNES section 2.1 is therefore imprecise and a clarification desirable.

Furthermore, DNES section 3.2 states:

"It shall be noted that the Event is a regular AIXM feature, therefore it has TimeSlices. This allows updating an Event:

- *each Event will be first encoded as a PERMDELTA/BASELINE TimeSlice pair;*
- *an eventual change in the Event information (the equivalent of a NOTAM Replacement or Cancellation) shall be encoded as an additional Event TimeSlice (PERMDELTA and modified BASELINE)."*

The first bullet item implies that each dnotam:Event is initialized via both a Permdelta and a Baseline timeslice. As discussed before, the Temporality Model does not require that each Permdelta is accompanied by an according Baseline and vice versa. Encoding a new dnotam:Event with both a Permdelta and Baseline appears to be counter-intuitive with respect to the goal of DNOTAM and the Temporality Model (to enable efficient encoding and communication of feature changes), as both timeslices will contain almost the same information. It is not clear if each new dnotam:Event has to be published with both Permdelta and Baseline or if creation and transmission of just one of the timeslices is sufficient.

There are several sections that are inconsistent in the way that they refer to static data:

- section 5.6.2.2: "*the Event update shall be encoded as a new PERMDELTA TimeSlice of the corresponding Event feature, with an incremented*

sequenceNumber. The PERMDELTA shall contain the updated value for the featureLifetime property. If the new end of validity is estimated, then the rules for Events with estimated end of validity shall be followed" - this only mentions Permdeltas

- section 5.6.3.2: "*ER-03: If the original Event has been encoded as one or more PERMDELTA/BASELINE TimeSlices for a new AIXM Feature, then the update shall be encoded as a 'correction' of the initial PERMDELTA TimeSlice, having the same sequenceNumber as the initial PERMDELTA ('1'), an increment correctionNumber ('1'), an empty gml:validTime with nilReason='inapplicable' and an empty aixm:featureLifetime with nilReason='inapplicable*'" - here, Permdeltas and Baselines are mentioned at first but then only Permdeltas are mentioned.

5.4.4.2 Available Options / Solutions

The following options were identified to provide sufficient clarification or to solve the problem for the imprecision in DNES section 2.1:

1. Revise the Temporality Model - If the Temporality Model required that each PERMDELTA has a corresponding BASELINE and that consequently there cannot be a sequence of PERMDELTAs without intermediate BASELINEs, the text in the DNES could be kept as is.
2. Instead of talking about "BASELINE" and "BASELINE TimeSlice(s)", the last two paragraphs of DNES section 2.1 could instead talk about "static data". A note or footnote should then be added to explain that according to the AIXM-TM static data is represented by both the BASELINE and the PERMDELTA timeslices of an AIXM feature.

The DNES should be explicit in how dnotam:Event data must be made available by a data originator and how Events may be published. According to sponsors, existing DNOTAM applications allow the client to decide how they want to get Event data encoded when it is pushed to them - as just Permdelta, Baseline or both. Apparently existing applications do not require that both Permdelta and Baseline are provided in an Event. However, if clients are allowed to choose which timeslice types are encoded in Events that are contained in messages then at least the data originator has to ensure that both Permdelta and Baselines are available for a dnotam:Event. To encode both timeslice types in a dnotam:Event that is communicated via messages should also be the default behavior.

The sections in the DNES with inconsistent way of referring to static data should be reviewed and rephrased according to the default behavior of having a Permdelta and Baseline as default for static changes to dnotam:Events.

5.4.4.3 Conclusion and Recommendation

Regarding clarification of section 2.1: the first option requires a change to the AIXM-TM. That change may impact existing systems and appears to be unnecessarily restrictive. The second option is therefore recommended.

Regarding creation, provision and encoding of dnotam:Events: the DNES should require that data originators create and maintain dnotam:Events with Permdeltas and according Baselines (keeping them in synch following the Temporality Model). It should require that the default behavior for publishing Events is to encode them using both timeslice types. However, it should also explicitly mention that applications may define ways to let clients indicate which timeslice type they want to receive.

Relevant statements in the DNES should be reviewed and revised if necessary with respect to inconsistent usage of static AIXM feature data timeslices: Permdeltas and Baselines.

5.4.5 Scenario Identifier for Event Update

5.4.5.1 Problem Statement and Description

Section 5.6 defines the rules for encoding an update to a previously published dnotam:Event. Such updates are currently defined for the cases of updating an Event's end time and for cancelling it. In both cases, the update is encoded as another dnotam:Event with a Permdelta timeslice instead of a Baseline.

It is essential that each dnotam:Event gets a unique gml:identifier. If a dnotam:Event did not have such an identifier then it cannot be updated as defined by the DNES. That the originator/publisher of a dnotam:Event has to assign a unique gml:identifier to the Event is implicit as an Event is an AIXM feature and AIXM features require that they get a unique gml:identifier value - see the "Feature Identification and Reference" document for further details. As this requirement on Event originators/publishers is not explicitly recorded in the DNES, there is a chance that developers and users of the DNES may not comply with it.

5.4.5.2 Available Options / Solutions

As the requirement to assign a gml:identifier is implicit the DNES does not necessarily need to be changed.

On the other hand, clarification on gml:identifier assignment may avoid confusion in the future. The last paragraph in DNES section 3.2 elaborates that an "Event is a regular AIXM feature" and that it can be updated because it has timeslices following the Temporality Model. A simple addition of "(which includes the assignment of a unique gml:identifier to the Event)" to the statement "each Event will be first encoded as a

PERMDELTA/BASELINE TimeSlice pair" would suffice to clarify that each dnotam:Event has to have a unique gml:identifier.

5.4.5.3 Conclusion and Recommendation

Even though repetition of requirements that are inherited from other specifications usually is a bad idea, we recommend to make an exception here and to revise the text in DNES section 3.2 as described in the previous section.

5.4.6 Embedding the Standard Version into the Scenario Identifier

5.4.6.1 Problem Statement and Description

Section 3.4 specifies how the scenario that a dnotam:Event was instantiated for is identified. The "scenario" property of a dnotam:Event contains the respective identifier. The DNES version number is embedded into this identifier.

It is good to know the version of the scenario that a given Event was encoded with because the rules (data encoding, automatic validation and text NOTAM production) may change between different versions of the DNES. Code - for example schematron validation rules - that was written for a specific scenario and version may thus be more easily re-used if the scenario rules have not changed.

That the "scenario" property also includes the DNES version is problematic, though, because it overloads the meaning of that property.

5.4.6.2 Available Options / Solutions

It may be that there are other benefits to this approach that have not been identified here. If this is the case then the DNES should identify them.

Otherwise, scenario identifier and DNES version should be separated and stored in distinct Event properties. Not mixing independent concepts in the same property value is good modeling practice.

5.4.6.3 Conclusion and Recommendation

We recommend to separate event scenario and DNES version and to model them as distinct dnotam:Event properties.

5.4.7 Improve Path Notation in Data Field Mappings

5.4.7.1 Problem Statement and Description

The DNES presents the data that is usually provided by the data originators for each event category in the form of "templates", using EBNF (Extended Backus Naur Form) and provided in graphical representation. Tables then provide a mapping from the data

items contained in the templates to the relevant field(s) in the AIXM model. The mapping is made through path expressions like the following:

- Navaid.type
- (NavaidEquipment and Navaid)/NavaidOperationalStatus.operationalStatus
- RunwayDirection/ManoeuvringAreaAvailability.operationalStatus
- AirportHeliport/..Availability/..Usage.operation
- AirportHeliport/..Availability/..Usage/ConditionCombination.logicalOperator
- AirportHeliport/..Availability/..Usage/../FlightCharacteristics
- Airport/AirportTimeSlice/TimePeriod.beginPosition
- Event/EventTimeSlice.validTime/timePosition
- Event/EventTimeSlice.featureLifetime/beginPosition
- aixm:Surface/gml:patches/gml:PolygonPatch/gml:exterior/gml:Ring/gml:curveMember/gml:Curve/gml:segments Apparently, the path notation used throughout the document is inconsistent:
- Sometimes timeslices are explicitly mentioned.
- Sometimes the path is abbreviated using "..".
- Sometimes a more UML / OCL like expression is used (with dot notation - for example Navaid.type).
- Sometimes an XPath like expression is used.
- etc.

A consistent path notation is desirable to avoid confusion and misunderstandings.

5.4.7.2 Available Options / Solutions

Two options to improve the path notation in the AIXM mappings were identified.

Option 1

The first option involves stating the class name of the relevant AIXM feature type first, followed by a dot-separated list of property names to point to the exact property that is of interest. For the examples from the previous section, this would look as follows:

Current DNES Notation	Proposed Notation (option 1)
Navaid.type	Navaid.type (so this is already ok)
(NavaidEquipment and Navaid)/NavaidOperationalStatus.operationalStatus	(Navaid|NavaidEquipment).availability.operationalStatus

Current DNES Notation	Proposed Notation (option 1)
RunwayDirection/ManoeuvringAreaAvailability.operationalStatus	RunwayDirection.availability.operationalStatus
AirportHeliport/..Availability/..Usage.operation	AirportHeliport.availability.usage.operation
AirportHeliport/..Availability/..Usage/ConditionCombination.logicalOperator	AirportHeliport.availability.usage.selection.logicalOperator
AirportHeliport/..Availability/..Usage/../FlightCharacteristics	AirportHeliport.availability.usage.selection.flight
Airport/AirportTimeSlice/TimePeriod.beginPosition	AirportHeliport.timeSlice.validTime(TM_Period).begin
Event/EventTimeSlice.validTime/timePosition	Event.timeSlice.validTime(TM_Instant).position
Event/EventTimeSlice.featureLifetime/beginPosition	Event.featureLifetime(TM_Period).begin
aixm:Surface/gml:patches/gml:PolygonPatch/gml:exterior/gml:Ring/gml:curveMember/gml:Curve/gml:segments	Surface.patch(GM_Polygon).boundary.exterior.generator.(GM_Curve.)segments

The following rules were used:

- The path starts with the name of a class, usually a <<feature>> type although an <<object>> type can also be used as long as the path is unambiguous within the given DNES scenario.
- Once the start is known, the path continues with a dot separated list of property names. Each property is of a certain type. If that type is simple, the path naturally ends. If the type is complex, the path may end. Otherwise the path continues, then continuing with the name of a property of the complex type we reached before. When the path ends then the value of the property represented by the last segment in the path is the mapping of the data item in the template.

- Choices in path elements - usually to allow two path expressions to be combined into one if only the start elements are different (see Navaid|NavaidEquipment example) - can be represented by separating the choice items with "|" and by putting the resulting string in parentheses.
- Path elements may target abstract types. For example, the type of "Surface.patch" in the example is abstract: *GM_ SurfacePatch*. There are multiple non-abstract subtypes of GM_SurfacePatch. In the example, GM_Polygon was chosen. To indicate that the value of a property is of a specific type, the type can be added in parentheses right after the property name. The path can then continue as usual - with the assumption that all properties of the subtype are accessible. If a property of the abstract type itself shall be followed - and thus implicitly allowing the value of the property to be of any non-abstract subtype - then the property would simply be stated by name, without any parentheses that further qualify it.
- If timeslice specific properties are of interest then the "timeSlice" is explicitly mentioned in the path expression, right after the name of the AIXM feature type at the start of the path. If the "timeslice" step is omitted then the path targets the given timeslice (e.g. Permdelta in a dnotam:Event or Tempdelta in the AIXM feature that points to a dnotam:Event and is given in a DNOTAM) or the timeslice that contains the applicable value of the targeted property (for example if a path involved resolving another AIXM feature and determining the value of one of its properties for a given time).
  Note that the featureLifetime is not a timeslice specific property but in fact a property of the feature itself. The timeslice specific properties are: validTime, sequenceNumber, correctionNumber, timeSliceMetadata and interpretation.
- If the begin or end of a time period - for example the valid time of a timeslice - shall be mapped, then the path would include a property named "begin" or "end", respectively. This follows the ISO 19108 UML model of TM_Period which only has a "begin" property for a TM_Period, not a "beginPosition". In GML, TM_Period is encoded by gml:TimePeriod. A gml:TimePeriod can encode its start time either via the "begin" property (including or referencing a gml:TimeInstant) or via the "beginPosition" property (which contains the start time position directly). The DNES should state that "validTime.begin" maps to "gml:validTime/gml:TimePeriod/gml:beginPosition" or "gml:validTime/gml:TimePeriod/gml:begin" - one of which has to be available in a gml:TimePeriod; same for the "featureLifetime" and end times.

The last example shown in the table is about a Surface, an <<object>> type defined by AIXM. This example is tricky because:

- Surface is derived from GM_Surface and thus the path needs to be looked up in ISO 19107. In general it is more simple to follow paths if they follow properties within the same model (like the AIXM or DNOTAM model). Paths with few steps are of course also simpler to follow than paths with many steps.
- The UML model from ISO 19107 and the XML encoding defined by GML do not always completely match up. Here we see that the UML model requires an additional step via the "boundary" property of a GM_Polygon to get to its "exterior" boundary. In GML the "exterior" boundary is a direct property of a PolygonPatch (the GML type that implements GM_Polygon). The naming may also differ: in the ISO UML model a GM_Ring has a property called "generator"; in GML the corresponding property is named "curveMember".

Option 2

Another option would be to use XPath like expressions. For the examples from the previous section, this would look as follows:

Current DNES Notation	Proposed Notation (option 2)
Navaid.type	aixm:Navaid/aixm:type
(NavaidEquipment and Navaid)/NavaidOperationalStatus.operationalStatus	(aixm:Navaid|aixm:NavaidEquipment)/aixm:availability/aixm:NavaidOperationalStatus/aixm:operationalStatus
RunwayDirection/ManoeuvringAreaAvailability.operationalStatus	aixm:RunwayDirection/aixm:availability/aixm:ManoeuvringAreaAvailability/aixm:operationalStatus
AirportHeliport/..Availability/..Usage.operation	aixm:AirportHeliport/aixm:availability/aixm:AirportHeliportAvailability/aixm:usage/aixm:AirportHeliportUsage/aixm:operation
AirportHeliport/..Availability/..Usage/ConditionCombination.logicalOperator	aixm:AirportHeliport/aixm:availability/aixm:AirportHeliportAvailability/aixm:usage/aixm:AirportHeliportUsage/aixm:selection/aixm:ConditionCombinator/aixm:logicalOperat

Current DNES Notation	Proposed Notation (option 2)
	or
AirportHeliport/..Availability/..Usage/../FlightCharacteristics	aixm:AirportHeliport/aixm:availability/aixm:AirportHeliportAvailability/aixm:usage/aixm:AirportHeliportUsage/aixm:selection/aixm:ConditionCombinator/aixm:flight/*
Airport/AirportTimeSlice/TimePeriod.beginPosition	aixm:AirportHeliport/aixm:timeSlice/*/gml:validTime/gml:TimePeriod/(gml:begin|gml:beginPosition)
Event/EventTimeSlice.validTime/timePosition	event:Event/aixm:timeSlice/*/gml:validTime/gml:TimeInstant/gml:timePosition
Event/EventTimeSlice.featureLifetime/beginPosition	event:Event/aixm:featureLifetime/gml:TimePeriod/gml:beginPosition
aixm:Surface/gml:patches/gml:PolygonPatch/gml:exterior/gml:Ring/gml:curveMember/gml:Curve/gml:segments	aixm:Surface/gml:patches/gml:PolygonPatch/gml:exterior/schema-element(gml:Ring)/gml:curveMember/gml:Curve/gml:segments

The following rules were used:

- As in option 1, the path starts with the qualified name of an element representing a <<feature>> type although an <<object>> type can also be used as long as the path is unambiguous within the given DNES scenario.
- Once the start is known, the path continues, following XPath notation (i.e. walking through the XML structure). The last element in the path expression is the mapping of the data item in the template. If that element is of simple type, then it is the value of the element. Otherwise it is the element itself (thus sometimes an additional "/*" at the end of the path is required).
- Choices in path elements - usually to allow two path expressions to be combined into one if only the start elements are different (see Navaid|NavaidEquipment example) - can be represented by separating the choice items with "|" and by putting the resulting string in parentheses.
- Path elements may target abstract types. To indicate that the value of a property is of a specific type, the XPath expression would just state it. To allow any

substitute of a given type to be included in the data, in other words to just work with the supertype (whether it is abstract or not is irrelevant here) one can include a schema-element() function - this is shown in the last example for the gml:Ring element.

- If timeslice specific properties are of interest then the "aixm:timeSlice" is explicitly stated in the path expression. If the "timeslice" step is omitted then the path targets the given timeslice (e.g. Permdelta in a dnotam:Event or Tempdelta in the AIXM feature that points to a dnotam:Event and is given in a DNOTAM) or the timeslice that contains the applicable value of the targeted property (for example if a path involved resolving another AIXM feature and determining the value of one of its properties for a given time).
  Again, note that the featureLifetime is not a timeslice specific property but in fact a property of the feature itself.
  An alternative would be to always include "aixm:timeSlice/*" in the path expressions.

5.4.7.3 Conclusion and Recommendation

Two options for a consistent path notation in the DNES were presented. The first option is easier to follow when looking at the UML model, while option 2 is easier to follow in the XML encoding. Option 2 appears to be more verbose than option 1.

To conclude, we can only recommend to review the path notation used in the DNES and to make it more consistent throughout the specification. The options suggested in the previous section may be useful for a revision of the path notation. Some rules may be too complex to realize and may thus be amended or omitted.

5.4.8 Additional Clarifications

Some of the requested clarifications do not justify the creation of new subsections, as the clarification is just a minor one in comparison. These minor clarifications are thus summarized in the following list:

- **Corridor encoding** - Section 5.3.2 of the DNES describes the encoding of a "Corridor". The according table entry should point to the "Use of GML in aeronautical data" document, which contains detailed information how to encode corridors in GML.
- **SAA.ACT non-duplication with other Events** - Section 4.2.5 of the DNES states that "*there should not exist another Airspace TEMPDELTA with an overlapping (partially or totally) gml:validTime and which also contains aixm:activation elements.*" It is not clear what "there" means - it could be the same message (AIXMBasicMessage or other container) or even an authoritative data store. The statement also is not explicit if the other "Airspace

TEMPDELTA" belongs to the same Airspace or to another Airspace (though the former definitely makes more sense).
The statement should be reconsidered and possibly removed, given that Tempdeltas with activation elements of the same Airspace may have the same validTime but different sequence or correction number. Furthermore, in some applications it might make sense to have Tempdeltas with overlapping validTime - e.g. when the application allows Airspace activations to be managed (reserved and approved or disapproved) and the according information is encoded via extension in Airspace activation elements.

- **SAA.NEW Airspace activity code for Parachute** – Section 4.4.5 of the DNES states: "*If aixm:type=PJE, then the geometry of the area should not intersect the geometry of an existing Airspace with type 'CTR' or 'TMA'.*" The path should be Airspace.activation.activity and not aixm:type. Furthermore, the value should be PARACHUTE and not PJE.
- **Event end time update handling of static data** - The rules ER-01 and ER-02 in section 5.6.2.2 of the DNES should be aggregated into one rule, because updating an Event's end time by issuing new Permdeltas and according Baselines usually is a combined activity. See section 5.4.4 for further details.
- **Identification of schedule annotation for Event NOTAM** - In section 5.2.6 of the DNES, a statement says that "[...] *any eventual TS.note (schedule annotations) shall be converted into free text* [...]". It is not clear which element of a digital NOTAM is identified by "TS.note" (PropertyWithSchedule.annotation, PropertyWithSchedule.timeInterval.annotation or something else). This should be clarified.
- **Cancellation of Inactive Event**
    - **Change of FeatureLifetime** - ER-02 in DNES section 5.6.3.2 states "*If the original Event has been encoded as one or more TEMPDELTA TimeSlices for existing AIXM Features, then the update shall be encoded as a 'correction' TimeSlice for each affected feature. A new TEMPDELTA shall be created having the same sequenceNumber as the initial PERMDELTA, an increment correctionNumber ('1'), an empty gml:validTime with nilReason='inapplicable' and an empty aixm:featureLifetime with nilReason='inapplicable'.*"

      First of all, there is a minor editorial issue: "PERMDELTA" should be replaced with "TEMPDELTA".
      What is more important is that the Tempdelta timeslices for existing AIXM features are cancelled by providing a correction timeslice with both the validTime and the featureLifetime being empty and nilReason set to

"inapplicable". Even though the Temporality Model section 3.7 has a diagram which reflects this behavior, the text there states the following: "*To clearly indicate that the change contained in the TimeSlice has been canceled, the gml:validTime property will be empty and it will have the nilReason attribute set to 'inapplicable'*". Also including an empty featureLifetime in the corrected timeslice appears to be unnecessary overhead and may even cause confusion in that an AIXM feature may be regarded as having been cancelled completely (in case that the corrected timeslice is of type Permdelta or Baseline). The diagram in the Temporality Model and the statement in the DNES should be revised by omitting the change of the featureLifetime - both in ER-02 of DNES section 5.6.3.2 and the "Feature TEMPDELTA correction" ADVR in section 5.6.3.3. Note that both of these sections deal with the cancellation of Tempdeltas.

Nilling the featureLifetime on Permdelta and Baseline timeslices that represent the commissioning of a new Event or AIXM feature (see ER-01 and ER-03 in DNES section 5.6.3.2 as well as the ADVRs "Event PERMDELTA correction" and "Feature PERMDELTA correction" in DNES section 5.6.3.3) may be appropriate to emphasize that the commissioning is cancelled. However, the ADVRs "Event PERMDELTA correction" and "Feature PERMDELTA correction" in DNES section 5.6.3.3 should be revised to state that nilling of featureLifetime should really be done only if the Permdelta represents the commissioning of an Event / AIXM feature (at the moment the ADVRs only talk about Permdeltas in general).

- **No other Event / AIXM feature data** - The ADVRs in DNES section 5.6.3.3 state which data the correction timeslice shall contain and explicitly says that no other data shall be included except the listed one. The list of allowed data should be reviewed. At least the gml:identifier of the affected Event / AIXM feature should always be included. In addition, aixm:timeSliceMetadata may be relevant and thus should be allowed as optional content. For an Event correction Permdelta, textNOTAM data can also be relevant.
- **Baseline data copy correctness -** The "Baseline data copy correctness" ADVRs in sections 4.8.5 and 4.10.5 of the DNES mention an "encompassing aixm:timeInterval". A telcon with sponsors revealed that this actually means that the time interval of the Tempdelta (that copies elements from the Baseline - see ADVR for further details) should be within the time interval of the Baseline. This should be clarified for both

ADVRs. It was mentioned that the rule should better be explained with a diagram, not only textual.

- **Navaid Unserviceable Scenario:**
  - **Operational status allowed values** - The “operational status allowed values” ADVR in DNES section 4.10.5 only deals with “NavaidEquipment”. It appears that the normative statement should also include “Navaid”. This would be in line with the data encoding rule ER-05, which is more generic in that it says that the values "FALSE_POSSIBLE" and "CONDITIONAL" cannot be used in the scenario at all. The normative statement for the “operational status allowed values” ADVR should therefore be reconsidered.
  - **ILS status consistency with Localizer** - The table of ER-09 in DNES section 4.10.4 does not cover the case described by ADVR “ILS status consistency with Localizer” in DNES section 4.10.5. ER-09 should thus be reviewed.
  - **ER-07** - The data encoding rule ER-07 in DNES 4.10.4 states: “In the case of a Navaid for which all its primary components NavaidEquipment are affected (have a temporarily changed operational status), then its NavaidOperationalStatus.operationalStatus attribute shall get the value specified by the ‘operational status’ input parameter.” - It is unclear what the “‘operational status’ input parameter” is. According to sponsors, this should be revised to state “... ‘operational status’ value.”
  - **ER-09** - The data encoding rule ER-09 in DNES section 4.10.4 only mentions the values UNSERVICEABLE, ON_TEST, FALSE_INDICATION and IN_CONSTRUCTION for the operational status. The automatic data validation rules list more status types: UNSERVICEABLE, ONTEST, INTERRUPT, FALSE_INDICATION, DISPLACED, OTHER and IN_CONSTRUCTION. ER-09 should be updated to also list all of these status values.

6 Validation Results - Automatic Validation Rules

6.1 Message Validation Rule Setup

Only AIXM XML documents that meet certain requirements can be considered as Digital NOTAM. Schematron is a useful tool for verifying that an AIXM document is also a Digital NOTAM. This section documents the development effort to create these schematron rules.

6.1.1 Schematron File Structure

The rules that govern Digital NOTAM encoding are broken into the following sections in the Schematron document:

- **General Aspects:** Covers rules derived from the general definition of Digital NOTAM taken from DNES or have been identified in this document.
- **Event Scenarios:** NOTAMs describe a limited number of scenarios that require a specific set of elements present. These are detailed in the Digital NOTAM Event specification, and the Schematron document is broken down into rule patterns that target these scenarios.

6.1.2 Rule Context

The Schematron rules have been defined with no absolute XPaths. Elements to validate are not anticipated in a particular location in the document. Instead any Event element that appears is considered a potential Digital NOTAM Event. :

- As Digital NOTAM messages are XML elements that may be only a part of a greater XML document such as a WFS response, the Schematron rules should not make assumptions on the structure of the document, only validate Event elements where they are found.
- The Schematron rules can also accommodate multiple Digital NOTAMs in the one XML document.

While DNES mentions the AIXMBasicMessage element as a useful container for a Digital NOTAM, though this is not mandated so these rules do not require it.

6.1.3 Multiple Events in a Single Document

Multiple Digital NOTAM Events may be included in a single XML document that is being validated. The Schematron rules must accommodate this, appropriately applying rules to each event.

6.1.4 Content Unassociated to the Event

The document being validated may include information not explicitly associated to an event in the document via an aixm:extension element. This shifts the validation focus from “all content must be related to an event, therefore all content will be tested” to “only content related to the event will be tested”. Introduction of rules that state a minimum set of information must be related to the event could be introduced. For instance a Navaid Unserviceable (NAV.UNS) event must have at least one Navaid or NavaidEquipment associated to it.

6.1.5 External Information Needed to Test Rules

Schematron relies on using XPath and XSLT to reference the elements to validate, and to define the validation rules themselves. In some cases the business rules for a Digital NOTAM will need to refer to content that is not available in the document being validated, but instead from the originating data source.

If the Schematron rules are designed to assume that all information is provided in-line then required information that is not in-line in the document will not validate.

If instead the Schematron rules assume all information that could be needed may not be in-line and therefore can’t be validated, rules that depend on the in-line information would avoid being tested all together.

The recommended compromise is to ensure the schematron only validates related information if it is available in-line. Rules are defined by specifying an XPath and validating any elements that match the XPath to a given set of rules. Care needs to be taken that these XPaths will not attempt to apply rules to missing elements, by applying these rules only if it the dependent information is present.

With this approach, rules that depend on information that may not be in-line will be validated if it has been embedded and ignored if it has not. Though this approach does not identify that some content may not have been validated, it is recommended as the best compromise for each potential situation.

Keep in mind that information that must be present will still be tested. This case only covers information that may not be present.

6.1.5.1 Validating TEMPDELTA against BASELINE / PERMDELTA

The most common situation that highlights the issue outlined above is when validating a TEMPDELTA against BASELINE / PERMDELTA information. Having access to tempdeltas, permdeltas and baselines of feature data may be difficult (for the schematron based validation) if that data is not supplied in the same XML instance document that is passed to the validator.

Some programmatic solution can certainly be designed, such as the validation tool being aware of the data source of the data being validated and how to query it for missing information.

This would most likely take the form of a WFS service, and could be more easily facilitated by allowing for this content to be in-line in the document. An alternative is some kind of WFS request inside the document to get the AIXM feature data via identifier would allow retrieval of the necessary information for validator implementations that support this.

6.2 Validation Coverage

One goal of the validation work was to make the work on schematron rules for automated testing of DNES requirements more visible. This has been done by documenting which requirements / normative statements from the DNES have been covered through schematron rules created in OWS-8.

Due to resource constraints, primarily the statements from scenarios with high sponsor priority were considered. The following list shows the scenarios sorted (in OWS-8) according to sponsor priority, in descending order:

1. Navaid unserviceable
2. Aerodrome closure
3. Runway closure
4. Other Event
5. Published special activity area – activation
6. Taxiway closure
7. Airport surface contamination
8. Published special activity area – creation
9. Ad-hoc ATS airspace – creation
10. Route portion closure
11. Route portion opening
12. New obstacle
13. Published ATS airspace - activation & deactivation

Schematron rules cover general rules from the DNES as well as rules specific for the first four scenarios in the list. See the coverage tables in *Annex A – Validation Coverage* for further details.

6.2.1 Gaps in Automatic Validation Rules

There are common situations where XML Schema and Schematron alone cannot provide automated validation for a given rule. This section lists these common situations.

Some normative statements require data that is not included in the document being validated, as discussed in the Handling External Information Needed to Test Rules section above.

6.2.2 Status of the XML Schema Files

The validation tool also performs XML Schema validation, but the package had difficulty using the schema files as they were presented. This was circumvented by making local manual changes to the schema files to allow Xerces (the XML parser / validation package used) to use them:

- Comments after the XML declaration (`<?xml version="1.0" encoding="UTF-8"?>`) but before the opening element caused a "Content is not allowed in prolog" validation error. This affected the following files which had comments moved to below the schema element opening tag.
    - AIXM_Features.xsd
    - AIXM_DataTypes.xsd
    - AIXM_AbstractGML_ObjectTypes.xsd
- ISO_19139_Schemas\gco\basicTypes.xsd caused the error "The targetNamespace of the referenced schema, currently 'http://www.opengis.net/gml/3.2', must be identical to that of the including schema, currently 'http://www.isotc211.org/2005/gco'". This was due to a namespace clash with a basicTypes.xsd file in the GML namespace. To resolve this locally the file name of the GCO XSD was changed to gco_basicTypes.xsd. This is likely indicative of a problem in the validation software's resolution of XSD resources, not in the XSD files themselves.

7 Accomplishments

- Conceptual issues within the proposed release version of DNES 1.0 were identified and documented. Where feasible, recommendations were made for solving these issues.
- A number of improvements - regarding both conceptual aspects and the way that the DNES is written - were identified and documented.
- Schematron rule sets for the automatic validation of DNOTAM Events were developed. The rule design offers a great level of flexibility in the way that such Events are included in XML documents. This enables automated validation of DNOTAM Events in various applications, re-using the same rule set.
- Normative statements in the DNES were identified and documented together with information about coverage of the statements by schematron rules. This allows DNES users to determine if a specific statement can be validated automatically. It also provides a way to better link the schematron rules and the DNES.

8 Annex A – Validation Coverage

The tables contained in this chapter provide information on which normative statements in the DNES can automatically be tested with schematron rules developed in OWS-8. Due to resource constraints, primarily the statements from scenarios with high sponsor priority were considered.

The coverage tables are structured as follows:

- The first column identifies the relevant normative statement[2].
- The second column identifies the source of the statement, which is usually a specific section or table of the DNES.
- The third column contains the identifier(s) of the schematron rule(s) that are used to check the statement on a given DNOTAM. An explanation is given in those cases where no schematron rule is available (yet) to check the statement. [3]

8.1 Coverage of General Aspects

8.1.1 Coverage of Normative Statements in Chapter 2 - General Requirements

Normative Statement	Source	Rule Coverage
In an AIXM file that contains an event encoding, the identifier shall also include the version of the Event Specification according to which the encoding was done.	DNES 2.5	dnes-2.5-1 Fails if any event version does not match the schematron DNES version.

[2]) Note that even though the DNES itself is not normative (as explained in chapter 5, it is currently considered only as guidance material) the rule statements in the DNES regarding encoding and use of a DNOTAM themselves are still normative for applications that are implemented according to the DNES.

[3]) As these rules are associated to the section numbers in the DNES, it would be ideal if future versions of DNES did not drastically alter the section numbering scheme. New scenarios should be appended to the end of section 4 so the section numbering of the current scenarios is not affected.

8.1.2 Coverage of Normative Statements in Chapter 3 - AIXM Event Schema

Normative Statement	Source	Rule Coverage
[...] when the validity of an Event is extended or shortened, this will result in an additional PERMDELTA TimeSlice for the Event feature, including the text of the NOTAM R or C that is published on that occasion.	DNES 3.2	TBD
The initial TimeSlice remains associated with the original NOTAM New, while the new TimeSlice [...]	DNES 3.2	TBD
It shall be noted that the Event is a regular AIXM feature, therefore it has TimeSlices. This allows updating an Event: • each Event will be first encoded as a PERMDELTA/BASELINE TimeSlice pair; • an eventual change in the Event information (the equivalent of a NOTAM Replacement or Cancellation) shall be encoded as an additional Event TimeSlice (PERMDELTA and modified BASELINE).	DNES 3.2	TBD Requires BASELINE data to be available Note: see section 5.4.4 for further information on handling Permdeltas / Baselines for DNOTAM Events.
an AIXM feature TimeSlice that "belongsTo" an Event should have the same start of validity as the Event lifetime start and the same end of validity as the Event lifetime end. This rule is true for most events, but exceptions are possible because complex events (such as an airshow), involving many features, could have slightly different start/end dates for the TimeSlices of the affected AIXM features	DNES 3.3	TBD Needs explicit rules on when it applies.
If type of TranslatedNOTAM is "TEXT_ONLY", then only simpleText is allowed and language is mandatory;	DNES 3.3	TBD Possible additional rule
coherence checks between the NOTAM B and C items with the included AIXM feature TimeSlice start of validity.	DNES 3.3	TBD Possible additional rule
Each scenario has an identifier … this value shall be	DNES 3.4	dnes-3.4.1

Normative Statement	Source	Rule Coverage
put into the “scenario” attribute of the Event feature Note that the scenario attribute is not mandatory for delta timeslices. The effect of the scenario attribute not being present is that Schematron cannot know what scenario type the event is and will not apply any scenario-specific rules.		
The scenario attribute should contain one of the following: SAA.ACT, ATSA.ACT, SAA.NEW, ATSA.NEW, RTE.CLS, RTE.OPN, AD.CLS, RWY.CLS, NAV.UNS, OBS.NEW, OBS.WDN, TWY.CLS, AD.CONT, OTHER	DNES 3.4	dnes-3.4.2

8.1.3 Coverage of Normative Statements in Chapter 5 - Data Encoding Rules

8.1.3.1 Coverage of normative statements in DNES section 5.1

Normative Statement	Source	Rule Coverage
events that have an estimated end of validity shall be updated before that time is reached	DNES 5.1	According to the results of a Q&A telcon performed during OWS-8 with sponsors, this is a rule for both the NOTAM operator and the originator system. They shall find and warn of all event for which the estimated end of validity is approaching. Therefore, this statement is not applicable for the validator.

8.1.3.2 Coverage of normative statements in DNES section 5.2.3

Normative Statement	Source	Rule Coverage
a Tempdelta shall contain a complete description of the operating times	DNES 5.2.3 (& AIXM-TM 2.7)	Not covered through DNOTAM schematron rules, as this is a requirement for general AIXM data, not one added through DNOTAM business rules. It should thus be covered through general AIXM schematron rules.
according to the OPADD, notification of a schedule modification by NOTAM shall be done by including the new schedule in item E, not in item D.	DNES 5.2.3	According to sponsor feedback, this statement is normative for editors of event scenarios. It is not applicable to the validator and therefore not covered via schematron rules.

8.1.3.3 Coverage of normative statements in DNES section 5.2.4

Normative Statement	Source	Rule Coverage
Each use of "daily", "on date", "date range", "on weekday", or "from weekday...to weekday" shall be encoded as a single Timesheet, according to the mapping table	DNES 5.2.4	TBD
All Timesheets shall get timeReference=UTC and daylightSavingAdjust=NO	DNES 5.2.4	TBD
If "on date" is used, then both the Timesheet.startDate and the Timesheet.endDate shall get the value specified for "on date"	DNES 5.2.4	TBD
If "on date" or "date range" are used, then Timesheet.day shall get the value "ANY" and Timesheet.dayTill shall be left empty	DNES 5.2.4	TBD

Normative Statement	Source	Rule Coverage
If "daily", "on weekday" or "from weekday...to weekday" are used, then in the corresponding Timesheet(s) both startDate and endDate shall be left empty	DNES 5.2.4	TBD
If "on weekday" is used, then Timesheet.day shall get that value and Timesheet.dayTill shall be left empty	DNES 5.2.4	TBD
If "exc. date" is used, then it shall be encoded as one Timesheet that has excluded=YES, startTime=00:00 and endTime=23:59; startDate and endDate shall both get the value specified for "exc. date"	DNES 5.2.4	TBD
If "exc. weekday" is used, then it shall be encoded as one Timesheet that has excluded=YES, startTime=00:00 and endTime=23:59; day shall get the value specified for "exc. weekday"; startDate and endDate shall be left empty	DNES 5.2.4	TBD
The values WORK_DAY, BEF_WORK_DAY, AFT_WORK_DAY, HOL, BEF_HOL, AFT_HOL and BUSY_FRI cannot be used in Timesheet.day or Timesheet.dayTill for Event Schedules	DNES 5.2.4	TBD
According to the OPADD, item D is not allowed to exceed 200 characters. The application interface should check the length of the item D that results from the schedule encoding and invite the operator to split the NOTAM into two separate events in case this limit is exceeded. The HMI should allow copying a draft event into a second draft event	DNES 5.2.4	According to a telcon with sponsors, this statement is normative for the originator system, not the validator. It is not a strict rule, rather a recommendation and should be reworded into “According to OPADD, item D

Normative Statement	Source	Rule Coverage
		should not exceed …”
It is not allowed to use "overnight" time periods in Event Schedules, e.g. 2200-0600. These shall be split into two separate time periods, e.g. 2200-2359 and 0000-0600	DNES 5.2.4	TBD
If a schedule is more complex than the supported by the Template provided for this scenario, then it shall be described in as a free text "note"	DNES 5.2.4	TBD

8.1.3.4 Coverage of normative statements in DNES section 5.2.6

Normative Statement	Source	Rule Coverage
any eventual TS.note (schedule annotations) shall be converted into free text according to the decoding rules for annotations and appended at the end of the item E of the NOTAM generated for the Event	DNES 5.2.6	This statement addresses NOTAM text production rules and is thus not covered by schematron tests.

8.1.3.5 Coverage of normative statements in DNES section 5.3.2

Normative Statement	Source	Rule Coverage

The AIXM encoding shall be done according to guidelines contained in the "Use of GML for aviation data" document.	DNES 5.3.2 (& “Use of GML for aviation data”)	Not covered through DNOTAM schematron rules, as this is a requirement for general AIXM data, not one added through DNOTAM business rules. It should thus be covered through general AIXM schematron rules.

8.1.3.6 Coverage of normative statements in DNES section 5.4

Normative Statement	**Source**	**Rule Coverage**
consistency rules between the uom value and the reference value (in “...Limit” and “...LimitReference” properties (like “upperLimit”, “lowerLimit”, “maximumLimit”, “minimumLimit”)	DNES 5.4.1.1	TBD
In addition to numerical values, the "...Limit" attributes can use four coded values (GND, UNL, FLOOR, CEILING) which also have special encoding rules regarding the uom attribute	DNES 5.4.1.2	TBD
for a “...Limit” property, the values FLOOR and CEILING may be used only in AirspaceLayer, in relation with AirspaceActivation, AirspaceLayerClass, RouteAvailability). The "...Reference" attribute shall be left empty in this situation. However, even if another uom is used or even if the "...Reference" attribute gets a value, they should be ignored by a recipient application because they do not have any meaning in combination with these coded values	DNES 5.4.1.2	TBD

8.1.3.7 Coverage of normative statements in DNES section 5.6.2

Normative Statement	**Source**	**Rule Coverage**

Normative Statement	Source	Rule Coverage
ER-01 the Event update shall be encoded as a new PERMDELTA TimeSlice of the corresponding Event feature, with an incremented sequenceNumber. The PERMDELTA shall contain the updated value for the featureLifetime property. If the new end of validity is estimated, then the rules for Events with estimated end of validity shall be followed[4]	DNES 5.6.2.2	TBD
ER-02 If the original Event has been encoded as one or more TEMPDELTA TimeSlices for existing AIXM Features, then the update shall be encoded as a "correction" TimeSlice for each affected feature. A new TEMPDELTA shall be created having the same content and sequenceNumber as the original one, an incremented correctionNumber and an updated end of validity. If the new end of validity is estimated, then the rules for Events with estimated end of validity shall be followed.	DNES 5.6.2.2	TBD
ER-03 If the original Event has been encoded as one or more PERMDELTA / BASELINE TimeSlices for a new AIXM Feature, then the update shall be encoded as an additional PERMDELTA TimeSlice, with an incremented sequenceNumber. A new BASELINE shall be created having the same data content as the original one, an incremented sequenceNumber, an updated end of validity and an updated feature lifetime.[5]	DNES 5.6.2.2	TBD
ER-04 If the Event update is an immediate cancellation of the condition that has triggered to the original event,	DNES 5.6.2.2	According to sponsors, this

[4] see section 5.4.4 for further details on the usage of Permdeltas and Baselines for dnotam:Events

[5] This rule can be combined with ER-01 in DNES section 5.6.2.2 - see list item “Event end time update handling of static data” in section 5.4.8 for further details.

Normative Statement	**Source**	**Rule Coverage**
then the current date & time of the system shall be used as gml:validTime.TimePeriod.endPosition.		statement applies to the data originator and is not applicable to the validator.
An Event update PERMDELTA TimeSlice shall include: ● a sequenceNumber higher than the one of the previous PERMDELTA and ● an aixm:featureLifetime element with a gml:endPosition different than the one of the previous PERMDELTA	DNES 5.6.2.3 / Event update PERMDELTA	TBD
For each AIXMFeature TEMPDELTA TimeSlice that was associated with the original Event encoding, there should exist a new TEMPDELTA for the same AIXMFeature that has: ● the same sequenceNumber and ● the same content and ● an incremented correctionNumber and ● a different value for the gml:validTime.TimePeriod.endPosition	DNES 5.6.2.3	TBD
For each AIXMFeature PERMDELTA TimeSlice that was associated with the original Event encoding, there should exist a new PERMDELTA for the same AIXMFeature that has: ● a sequenceNumber higher than the one of the previous PERMDELTA and ● an aixm:featureLifetime element with a gml:endPosition different than the one of the previous PERMDELTA ● no other content	DNES 5.6.2.3	TBD

8.1.3.8 Coverage of normative statements in DNES section 5.6.3

Normative Statement	Source / ADVR Title	Rule Coverage
ER-01: the Event cancellation shall be encoded as "correction" of the initial PERMDELTA TimeSlice. The PERMDELTA shall contain the same sequenceNumber as the initial PERMDELTA ("1"), an increment correctionNumber ("1"), an empty gml:validTime with nilReason="inapplicable" and an empty aixm:featureLifetime with nilReason="inapplicable"	DNES 5.6.3.2	TBD
ER-02: If the original Event has been encoded as one or more TEMPDELTA TimeSlices for existing AIXM Features, then the update shall be encoded as a "correction" TimeSlice for each affected feature. A new TEMPDELTA shall be created having the same sequenceNumber as the initial PERMDELTA, an increment correctionNumber ("1"), an empty gml:validTime with nilReason="inapplicable" and an empty aixm:featureLifetime with nilReason="inapplicable"..	DNES 5.6.3.2	TBD
ER-03: If the original Event has been encoded as one or more PERMDELTA/BASELINE TimeSlices for a new AIXM Feature, then the update shall be encoded as a "correction" of the initial PERMDELTA TimeSlice, having the same sequenceNumber as the initial PERMDELTA ("1"), an increment correctionNumber ("1"), an empty gml:validTime with nilReason="inapplicable" and an empty aixm:featureLifetime with nilReason="inapplicable".	DNES 5.6.3.2	TBD
The Event correction PERMDELTA TimeSlice shall have: • the same sequenceNumber as the initial PERMDELTA • an increment correctionNumber • an empty gml:validTime with nilReason="inapplicable"	DNES 5.6.3.3 / Event PERMDELTA correction	TBD

Normative Statement	Source / ADVR Title	Rule Coverage
• an empty aixm:featureLifetime with nilReason="inapplicable" • no other Event data		
For each AIXM Feature TEMPDELTA TimeSlice that was associated with the original Event encoding, there should exist a new TEMPDELTA for the same AIXMFeature that has: • the same sequenceNumber as the initial TEMPDELTA • an increment correctionNumber • an empty gml:validTime with nilReason="inapplicable" • an empty aixm:featureLifetime with nilReason="inapplicable" • no other Feature data	DNES 5.6.3.3 / Feature TEMPDELTA correction	TBD
For each AIXMFeature PERMDELTA TimeSlice that was associated with the original Event encoding, there should exist a new PERMDELTA for the same AIXMFeature that has: • the same sequenceNumber as the initial PERMDELTA • an increment correctionNumber • an empty gml:validTime with nilReason="inapplicable" • an empty aixm:featureLifetime with nilReason="inapplicable" • no other Feature data	DNES 5.6.3.3 / Feature PERMDELTA correction	TBD

8.1.3.9 Coverage of normative statements in DNES section 5.8

Normative Statement	Source	Rule Coverage
The size of the bounding box shall be estimated based on the same OPADD rules that are applied for the calculation of the location/radius of an ICAO NOTAM, but encoded as a square with	DNES 5.8	OPADD rules are guidance for the data operator/originator;

Normative Statement	Source	Rule Coverage
lower-left and upper-right corner positions.		but not all the rules are intended for automatic validation - including this one

8.2 Event Scenarios

8.2.1 Coverage of "Published Special Activity Area - Activation" Scenario [SAA.ACT]

8.2.1.1 Coverage of Automatic Data Validation Rules

Normative Statement	Source / ADVR Title	Rule Coverage
As a minimum, in addition to the AIXM mandatory properties gml:validTime and aixm:interpretation, the Airspace TEMPDELTA TimeSlice shall contain at least aixm:sequenceNumber and one aixm:activation element with at least the aixm:status, aixm:upperLimit, aixm:lowerLimit descendant elements specified (not NIL).	DNES 4.2.5 / Minimal data requirements	TBD
There should not exist another Airspace TEMPDELTA with an overlapping (partially or totally) gml:validTime and which also contains aixm:activation elements.[6]	DNES 4.2.5 / Non-duplication with other Events	TBD
The value of the Airspace BASELINE aixm:type shall be either "P", "R", "D", "TSA", "TRA", "D_OTHER", "W", "PROTECT" (as any other value would be in conflict with the purpose of this	DNES 4.2.5 / Airspace type consistent with the	TBD

[6]See item "SAA.ACT non-duplication with other Events" in section 5.4.8 for further details

Normative Statement	Source / ADVR Title	Rule Coverage
scenario).	scenario	
The value of the aixm:status (activation status) shall be either "ACTIVE", "IN_USE" or "INTERMITTENT" (as any other value would be in conflict with the purpose of this scenario).	DNES 4.2.5 / Activation status consistent with scenario	TBD
The value of the aixm:activity (activity taking place) shall not have the values: • "AD_TFC", "HELI_TFC" "ATS", "PROCEDURE" (as these values are specific to the ATS Airspace activation scenario); • "MILOPS", "FIRE_FIGHTING", "BIRD", "BIRD_MIGRATION" (as these are expected to be subject of ad-hoc areas only); • "LASER", "HI_LIGHT" (as these are expected to be reasons for caution around airports, announced only by ad-hoc areas if necessary).	DNES 4.2.5 / Activity consistent with scenario	TBD
If the Airspace TEMPDELTA AirspaceActivation includes an AirspaceLayer that has upperLimit bigger than the any of the AirspaceGeometryComponent.upperLimit of that Airspace BASELINE, then the TEMPDELTA shall also include an equal number of AirspaceGeometryComponent (copied from BASELINE) but with upperLimit equal with that of the TEMPDELTA AirspaceActivation (that temporarily re-defines the vertical extent of the airspace)	DNES 4.2.5 / Upper limit change	TBD
If the Airspace TEMPDELTA AirspaceActivation includes an AirspaceLayer that has lowerLimit smaller than the any of the	DNES 4.2.5 / Lower limit	TBD

Normative Statement	Source / ADVR Title	Rule Coverage
AirspaceGeometryComponent.lowerLimit of that Airspace BASELINE, then the TEMPDELTA shall also include an equal number of AirspaceGeometryComponent (copied from BASELINE) but with lowerLimit equal with that of the TEMPDELTA AirspaceActivation (that temporarily re-defines the vertical extent of the airspace).	change	
If in the BASELINE Airspace data includes one or more activation elements with the aixm:status="AVBL_FOR_ACTIVATION" associated with one or more aixm:timeInterval (schedules), then the time periods described by Airspace TEMPDELTA TimeSlice (gml:validTime and the eventual included aixm:timeInterval when the aixm:status="ACTIVE" or "IN_USE") shall be within time defined by the BASELINE schedule	DNES 4.2.5 / Activation inside pre-defined schedule	TBD Requires BASELINE data to be available Note: see section 5.4.4 for further information on handling Permdeltas / Baselines for DNOTAM Events.
For each AirspaceActivation included in the TEMPDELTA that has an associated annotation with purpose=REMARK and the text="Baseline data copy. Not included in the NOTAM text generation", there shall exist an equivalent AirspaceActivation in the BASELINE data, having: ● the same aixm:activity and aixm:status; ● equal or smaller aixm:levels/lowerLimit value; ● equal or higher aixm:levels/upperLimit value; ● an encompassing aixm:timeInterval	DNES 4.2.5 / Baseline data copy correctness	

8.2.1.2 Coverage of Additional Normative Statements

Normative Statement	Source	Rule Coverage

Normative Statement	Source	Rule Coverage
ER-04: If the area activation is limited to a discrete schedule within the overall time period between the "start time" and the "end time", then this shall be encoded using as many as necessary timeInterval/Timesheet properties for the AirspaceActivation of the Airspace TEMPDELTA Timeslice. See the rules for Event Schedules.	DNES 4.2.4	TBD
ER-05: In accordance with the AIXM Temporality Concept [...], the AirspaceActivation associated with the TEMPDELTA completely replaces all the BASELINE AirspaceActivation information, during the TEMPDELTA time of applicability. Therefore, if the activation only concerns certain times and/or levels, the other times and/or levels, when the airspace eventually remains with the same status as in the Baseline data, shall be explicitly included in the TEMPDELTA. [...] All AirspaceActivation elements that are copied from the BASELINE data for completeness sake shall get an associated Note with purpose=REMARK and the text="Baseline data copy. Not included in the NOTAM text generation".	DNES 4.2.4	TBD
ER-06: If the BASELINE Airspace has a type different from P (Prohibited) and the information received from the originator indicates that the area is "prohibited", "compulsory bypass", "no fly zone" or equivalent during its activation, then the Airspace TEMPDELTA TimeSlice shall also modify the Airspace type="P". This shall be done even if the prohibition concerns only certain flights, aircraft types, a part of the airspace, etc. [...]	DNES 4.2.4	This rule applies to the data originator. It cannot be automatically tested because the validation engine does not have the additional information that an area is “prohibited”, “compulsory bypass”, “no fly zone” etc.

Normative Statement	Source	Rule Coverage
ER-07: The activity types that do not match a pre-defined value in the CodeAirspaceActivityType shall be encoded as follows: • captive balloon -> activity=OTHER:CAPTIVE_BALLOON • kite activities -> activity=OTHER:KITE • demolition using explosive devices -> activity=OTHER:DEMOLITION • mass movement of aircraft ->activity=OTHER:ACFT_MASS_MOVEMENT • aerial survey / photogrammetic flights -> activity=OTHER:AERIAL_SURVEY • flying in formation -> activity=OTHER:ACFT_FORMATION • model flying -> OTHER:MODEL	DNES 4.2.4	TBD Schematron tests could check that only these values are used with the "OTHER:" pattern - and give a warning if a different "OTHER:" value was found.

8.2.2 Coverage of "Published ATS Airspace - Activation or Deactivation" Scenario [ATSA.ACT]

8.2.2.1 Coverage of Automatic Data Validation Rules

Normative Statement	Source / ADVR Title	Rule Coverage
As a minimum, in addition to the AIXM mandatory properties gml:validTime and aixm:interpretation, the Airspace TEMPDELTA TimeSlice shall contain at least aixm:sequenceNumber and one aixm:activation element with at least the aixm:status, aixm:upperLimit, aixm:lowerLimit descendant elements specified (not NIL).	DNES 4.3.5 / minimal data requirement	TBD
There should not exist another Airspace TEMPDELTA with an overlapping (partially or totally) gml:validTime and which also contains aixm:activation elements.	DNES 4.3.5 / Non-duplication with other	TBD

Normative Statement	Source / ADVR Title	Rule Coverage
	Events	
The value of the Airspace BASELINE aixm:type shall be either "CTA", "CTA_P", "OCA", "OCA_P", "UTA", "UTA_P", "TMA", "TMA_P", "CTR", "CTR_P", "OTA", "OTA_P", "SECTOR", "SECTOR_C", "RAS", "ADIZ", "CLASS", "ADV", "UADV", "ATZ", "ATZ_P", "HTZ", "OTHER:TIA", "OTHER:TIZ" or "OTHER:FIZ" (as any other value would be in conflict with the purpose of this scenario).	DNES 4.3.5 / Airspace type consistent with the scenario	TBD
If in the TEMPDELTA Airspace data includes one or more activation elements associated with one or more aixm:timeInterval (schedules), then at least one of these shall have the aixm:status="ACTIVE".	DNES 4.3.5 / Schedule requires ACTIVE times to be specified	TBD
If in the BASELINE Airspace data includes one or more activation elements with the aixm:status="AVBL_FOR_ACTIVATION" associated with one or more aixm:timeInterval (schedules), then the time periods described by Airspace TEMPDELTA TimeSlice (gml:validTime and the eventual included aixm:timeInterval when the aixm:status="ACTIVE") shall be within time defined by the BASELINE schedule	DNES 4.3.5 / Activation inside pre-defined schedule	TBD
For each AirspaceActivation included in the TEMPDELTA that has an associated annotation with purpose=REMARK and the text="Baseline data copy. Not included in the NOTAM text generation", there shall exist an equivalent AirspaceActivation in the BASELINE data, having:	DNES 4.3.5 / Baseline data copy correctness	TBD

Normative Statement	Source / ADVR Title	Rule Coverage
• the same aixm:activity and aixm:status; • equal or smaller aixm:level/lowerLimit value; • equal or higher aixm:levels/upperLimit value; • an encompassing aixm:timeInterval.		

8.2.2.2 Coverage of Additional Normative Statements

Normative Statement	Source	Rule Coverage
Actiation status must be a value of the `CodeStatusAirspaceType` list.	DNES 4.3.2	TBD
ER-01: The activation of an airspace shall be encoded as: • a new Event, [...]; • a TimeSlice of type TEMPDELTA for the corresponding Airspace feature, for which the "event:theEvent" property points to the Event instance created above; the TEMPDELTA shall contain one or more AirspaceActivation objects.	DNES 4.3.4	TBD
ER-02: The Airspace TEMPDELTA should use the values "FLOOR, uom=OTHER" for lowerLimit and "CEILING, uom=OTHER" for the upperLimit of the AirspaceLayer property associated with the AirspaceActivation.	DNES 4.3.4	TBD
ER-03: If the area activation/de-activation is limited to a discrete schedule within the overall time period between the "start time" and the "end time", then this shall be encoded using as many as necessary timeInterval/Timesheet properties for	DNES 4.3.4	TBD

Normative Statement	Source	Rule Coverage
the AirspaceActivation of the Airspace TEMPDELTA Timeslice. See the rules for Event Schedules (shortened).		
ER-04: AirpsaceActivation associated with the TEMPDELTA completely replaces BASELINE data during the TEMPDELTA time of applicability. Therefore, the other times shall be included in the TEMPDELTA explicitly (summarized, see DNES 4.3.4).	DNES 4.3.4	TBD

8.2.3 Coverage of "Ad-hoc Special Activity Area - Creation" Scenario [SAA.NEW]

8.2.3.1 Coverage of Automatic Data Validation Rules

Normative Statement	Source / ADVR Title	Rule Coverage
As a minimum, in addition to the AIXM mandatory properties gml:validTime and aixm:interpretation, the Airspace BASELINE TimeSlice shall contain at least aixm:sequenceNumber, aixm:type, aixm:geometryComponent (including aixm:horizontalProjection, aixm:lowerLimit, aixm:lowerLimitReference, aixm:upperLimit, aixm:upperLimitReference) and at least one aixm:activation element with at least the aixm:status descendant element specified (not NIL).	DNES 4.4.5 / Minimal data requirements	TBD
There should not exist another Airspace BASELINE with the same aixm:geometryComponent and an overlapping (partially or totally) gml:validTime.	DNES 4.4.5 / Non-duplication with other events	Not testable with schematron as the validation would have to be able to access the list of all existing airspaces and then perform a

Normative Statement	Source / ADVR Title	Rule Coverage
		check on the geometry component and valid time. While the latter may be doable, the former is out of scope for simple DNOTAM validation via schematron.
The value of the aixm:activity (activity taking place) shall not have the values "AD_TFC", "HELI_TFC" "ATS", "PROCEDURE" (as these values are specific to the Ad-hoc ATS Airspace establishment scenario).	DNES 4.4.5 / Activity consistent with scenario	TBD
If aixm:type=PJE, then the geometry of the area should not intersect the geometry of an existing Airspace with type "CTR" or "TMA".	DNES 4.4.5 / PJE not allowed within TMA/CTR	TBD Note the "should" in the statement: this statement is a recommendation → in automatic validation then if this rule is violated a warning should be raised, not an error
There should not exist any other Airspace with the same aixm:designator value.	DNES 4.4.5 / Uniqueness of designator	TBD

8.2.3.2 Coverage of Additional Normative Statements

Normative Statement	Source	Rule Coverage
Only geometries of type Polygon, Circle or Corridor are allowed in this scenario	DNES 4.4.2	TBD

Normative Statement	Source	Rule Coverage
ER-01: The special activity area shall be encoded as: • a new Event, [...]; and • a new Airspace, for which PERMDELTA and subsequent BASELINE TimeSlices shall be created; the property "event:theEvent" of the Airspace TimeSlices shall refer to the Event mentioned above	DNES 4.4.4	TBD
ER-02: The Airspace BASELINE shall contain one AirspaceActivation object with status=ACTIVE, IN_USE or INTERMITTENT (as appropriate) which shall also include the "activity" data and the values "FLOOR, uom=OTHER" for lowerLimit and "CEILING, uom=OTHER" for the upperLimit of the associated AirspaceLayer.	DNES 4.4.4	TBD
ER-03: If the area activity is limited to a discrete schedule within the overall time period between the "start time" and the "end time", then this shall be encoded using as many as necessary timeInterval/Timesheet properties for the AirspaceActivation with status ACTIVE/IN_USE/INTERMITTENT of the BASELINE Timeslice. See also the rules for Event Schedules	DNES 4.4.4	TBD
ER-04: If a schedule is provided, then the Airspace BASELINE shall contain a second AirspaceActivation object with status=INACTIVE, which shall explicitly specify the times not covered by the activity schedule.	DNES 4.4.4	TBD
ER-05: If one or more "exclude airspace" are specified, each shall be encoded as an AirspaceGeometryComponent with operation=SUBTR, operationSequence as dictated by the order of the element, contributorAirspace/AirspaceVolumeDependency.dependency=FULL_GEOMETRY and pointing to the	DNES 4.4.4	TBD

Normative Statement	Source	Rule Coverage
airspace concerned. In addition, when the AIXM 5.1 encoded data is provided to a client, the data corresponding to the AirspaceVolume(s) of the contributorAirspace (lowerLimit, lowerLimitReference, upperLimit, upperLimitReference, horizontalProjection, etc.) shall be copied in the AirspaceVolume(s) of the current Airspace. This will provide a complete description of the current Airspace, eliminating the need to traverse the xlink:href in order to get the full geometrical information		
ER-06: The activity types that do not match a pre-defined value in the CodeAirspaceActivityType shall be encoded as follows: ● captive balloon -> activity=OTHER:CAPTIVE_BALLOON ● kite activities -> activity=OTHER:KITE ● demolition using explosive devices -> activity=OTHER:DEMOLITION ● mass movement of aircraft ->activity=OTHER:ACFT_MASS_MOVEMENT ● flying in formation -> activity=OTHER:ACFT_FORMATION ● aerial survey/photogrammetric flights -> activity=OTHER:AERIAL_SURVEY ● model flying -> OTHER:MODEL ● airborne spread of diseases -> activity=OTHER:BIO_HAZARD ● industrial action -> activity=OTHER:STRIKE ● volcanic activity, possibly indication imminent eruption -> activity=OTHER:VOLCANO_ACTIVE ● confirmed volcanic eruption -> activity=OTHER:VOLCANO_ERUPTION ● volcanic ash area of high contamination -> activity=OTHER:ASH_HIGH ● volcanic ash area of medium contamination -> activity=OTHER:ASH_MEDIUM	DNES 4.4.4	TBD The statement lists the "OTHER" values that are allowed for the scenario. If a different "OTHER" value is found then a schematron validator should raise a warning.

Normative Statement	Source	Rule Coverage
• volcanic ash area of low contamination -> activity=OTHER:ASH_LOW • unspecified hazard -> activity=OTHER		
ER-07: If the type is not provided by the data originator, then the following encoding rules shall be applied in order to give a value to "type" attribute of the Airspace BASELINE TimeSlice: • if the notes encoded for the area indicate that the area is "prohibited", "compulsory bypass", "no fly zone" or equivalent for certain flights or aircraft, partially or totally, then the type "P" shall be allocated; • if the notes encoded for the area indicate that the area may be crossed following approval from a specified authority, then type "R" shall be allocated; • if the activity encoded is one of the following, then the type "D-OTHER" shall be allocated: AERIAL_WORK, CROP_DUSTING, FIRE_FIGHTING, NAVAL_EXER, BIRD, BIRD_MIGRATION, LASER, HI_RADIO, HI_LIGHT, SPORT, AEROBATICS, TRAINING, JET_CLIMBING, REFUEL, GLIDING, BLASTING, WATER_BLASTING, BALLOON, RADIOSONDE, TOWING, MISSILES, AIR_GUN, ARTILLERY, SHOOTING, ANTI_HAIL, FIREWORK, SPACE_FLIGHT, PARACHUTE, PARAGLIDER, HANGGLIDING, ULM, AIR_DROP, CHEMICAL, NUCLEAR, REFINERY, TECHNICAL, GAS, OIL, UAV, OTHER:DEMOLITION, OTHER:CAPTIVE_BALLOON, OTHER:KITE, OTHER:ACFT_MASS_MOVEMENT, OTHER:ACFT_FORMATION, OTHER:AERIAL_SURVEY, OTHER:VOLCANO_ACTIVE, OTHER:VOLCANO_ERUPTION,	DNES 4.4.4	This is a rule for the data originator. It requires human interpretation to infer the correct airspace type if it has not been provided. However, schematron rules could be created to interpret remark notes contained in the DNOTAM and check that their content matches with the "type" of the airspace.

Normative Statement	Source	Rule Coverage
OTHER:ASH_HIGH, OTHER:ASH_MEDIUM, OTHER:ASH_LOW, OTHER:MODEL; • if the activity encoded is one of the following, then the type "PROTECT" shall be allocated: ACCIDENT, POPULATION, NATURE, FAUNA, NO_NOISE, VIP, VIP_PRES, VIP_VICE;		
ER-08: It is recommended that an alphanumeric designator is allocated to a temporary area, in order to facilitate it's identification on graphical representations (such as airspace activity maps) and verbal communication. The composition rule is derived from the ICAO Annex 15 rules for P, D, R area designators: CCLnnnn-yy, where: • CC is the Country Code; this could be expanded into a full FIR identifier if necessary to have a finer granularity of the airspace reference; • L is a letter that corresponds to the area type; • nnnn is a number, unduplicated during the same year, within the State or territory concerned; this could also be the NOTAM number; • yy are the last two digits of the year date when the area becomes effective	DNES 4.4.4	TBD The designator is created by an automated system so the risk to get it wrong is likely low. Schematron rules could check this statement on specific sources that follow the rules described in the statement to create the designator.

8.2.4 Coverage of "Ad-hoc ATS Airspace - Creation" Scenario [ATSA.NEW]

8.2.4.1 Coverage of Automatic Data Validation Rules

Normative Statement	Source / ADVR Title	Rule Coverage
As a minimum, in addition to the AIXM mandatory properties gml:validTime and aixm:interpretation, the Airspace BASELINE	DNES 4.3.5 / minimal data	TBD

Normative Statement	Source / ADVR Title	Rule Coverage
TimeSlice shall contain at least aixm:sequenceNumber, aixm:type, aixm:geometryComponent (including aixm:horizontalProjection, aixm:lowerLimit, aixm:lowerLimitReference, aixm:upperLimit, aixm:upperLimitReference) at least one aixm:class element with at least one aixm:classification descendant element specified (non NIL) and at least one aixm:activation element with at least the aixm:status descendant element specified (not NIL).	requirements	
There should not exist another Airspace BASELINE with the same aixm:geometryComponent and an overlapping (partially or totally) gml:validTime.	DNES 4.3.5 / Non-duplication with other Events	TBD
There should not exist any other Airspace with the same aixm:designator value.	DNES 4.3.5 / Uniqueness of designator	TBD
The Airspace aixm:type shall have one of the following values: CTR, CTR_P, ADIZ, CTA, CTA_P, OCA, OCA_P, SECTOR, SECTOR_C, RAS, CLASS, HTZ, AWY, TMA, TMA_P, ADV, UADV, ATZ, ATZ_P or OTHER:...)	DNES 4.3.5 / Area type consistency with scenario	TBD

8.2.4.2 Coverage of Additional Normative Statements

Normative Statement	Source	Rule Coverage
Only geometries of type Polygon, Circle or Corridor are allowed in this scenario.	DNES 4.5.2	TBD

Normative Statement	Source	Rule Coverage
ER-01: The special activity area shall be encoded as: • a new Event, [...]; and • a new Airspace, for which PERMDELTA and s ubsequent BASELINE TimeSlices shall be created; the property "event:theEvent" of the Airspace TimeSlices shall refer to the Event mentioned above	DNES 4.5.4	TBD
ER-02: The Airspace BASELINE shall contain one AirspaceActivation object with status=ACTIVE, IN_USE or INTERMITTENT (as appropriate) which shall have the values "FLOOR, uom=OTHER" for lowerLimit and "CEILING, uom=OTHER" for the upperLimit of the associated AirspaceLayer.	DNES 4.5.4	TBD
ER-03: The Airspace BASELINE shall contain one AirspaceLayerClass object which shall have the values "FLOOR, uom=OTHER" for lowerLimit and "CEILING, uom=OTHER" for the upperLimit of the associated AirspaceLayer.	DNES 4.5.4	TBD
ER-04: If the area activity is limited to a discrete schedule within the overall time period between the "start time" and the "end time", then this shall be encoded using as many as necessary timeInterval/Timesheet properties for the AirspaceActivation with status ACTIVE/IN_USE/INTERMITTENT of the BASELINE Timeslice. See also the rules for Event Schedules.	DNES 4.5.4	TBD
ER-05: If a schedule is provided, then the Airspace BASELINE shall contain a second AirspaceActivation object with status=INACTIVE, which shall explicitly specify the times not covered	DNES 4.5.4	TBD

Normative Statement	Source	Rule Coverage
by the activity schedule. This shall be done automatically by the system and should not be visible to the operator. The "INACTIVE" times shall not be translated into NOTAM text. See also the rules for Event Schedules.		
ER-06: If one or more "exclude airspace" are specified, each shall be encoded as an AirspaceGeometryComponent with operation=SUBTR, operationSequence as dictated by the order of the element, contributorAirspace/AirspaceVolumeDependency.dependency=FULL_GEOMETRY and pointing to the airspace concerned. In addition, when the AIXM 5.1 encoded data is provided to a client, the data corresponding to the AirspaceVolume(s) of the controbutorAirspace (lowerLimit, lowerLimitReference, upperLimit, upperLimitReference, horizontalProjection, etc.) shall be copied in the AirspaceVolume(s) of the current Airspace. This will provide a complete description of the current Airspace, eliminating the need to traverse the xlink:href in order to get the full geometrical information.	DNES 4.5.4	TBD

8.2.5 Coverage of "Route Portion Closure" Scenario [RTE.CLS]

8.2.5.1 Coverage of Automatic Data Validation Rules

Normative Statement	Source / ADVR Title	Rule Coverage
As a minimum, in addition to the AIXM mandatory properties gml:validTime and aixm:interpretation, each RouteSegment TEMPDELTA TimeSlice shall contain at least one aixm:RouteAvailability with at least aixm:status, aixm:direction and aixm:levels	DNES 4.6.5 / minimal data requirements	TBD

Normative Statement	Source / ADVR Title	Rule Coverage
specified (not NIL).		
For each RouteSegment TEMPDELTA created by the Event, there should not exist another RouteSegment TEMPDELTA with an overlapping (partially or totally) gml:validTime and containing aixm:RouteAvailability elements.	DNES 4.6.5 / Non-duplication with other Events	TBD
There should exist at least one BASELINE RouteAvailability with status=OPEN or COND for one of the levels and times (if specified in a Baseline schedule) affected by the TEMPDELTA.	DNES 4.6.5 / Closure only possible for normally open routes	TBD
For each RouteAvailability included in the TEMPDELTA that has an associated annotation with purpose=REMARK and the text="Baseline data copy. Not included in the NOTAM text generation", there shall exist an equivalent RouteAvailability in the BASELINE data, having: • the same aixm:direction, aixm:cardinalDirection and aixm:status; • equal or smaller aixm:levels/lowerLimit value; • equal or higher aixm:levels/upperLimit value; • an encompassing aixm:timeInterval.	DNES 4.6.5 / Baseline data copy correctness	TBD

8.2.5.2 Coverage of Additional Normative Statements

Normative Statement	Source	Rule Coverage
ER-01: The temporary closure of a route portion shall be encoded as: • a new Event, [...];	DNES 4.6.4	TBD

Normative Statement	Source	Rule Coverage
a new TEMPDELTA Timeslice for each individual RouteSegment that is located on the route portion specified in the event data.		
ER-03: A RouteAvailability object with status=CLSD, direction=BOTH and at least one associated level.AirspaceLayer object shall be included in the Tempdelta Timeslice for each RouteSegment concerned.	DNES 4.6.4	TBD
ER-04: If no lower limit is specified in the Event data, then the associated level.AirspaceLayer should contain the values lowerLimit="FLOOR" (uom=OTHER").	DNES 4.6.4	TBD
ER-05: If no upper limit is specified in the Event data, then the associated level.AirspaceLayer should contain the values lowerLimit="CEILING" (uom=OTHER").	DNES 4.6.4	TBD
ER-06: RouteAvailability associated with the TEMPDELTA completely replaces BASELINE data during the TEMPDELTA time of applicability. Therefore, the other times shall be included in the TEMPDELTA explicitly (summarized, see DNES 4.6.4).	DNES 4.6.4	TBD

8.2.6 Coverage of "Route Portion Opening" Scenario [RTE.OPN]

8.2.6.1 Coverage of Automatic Data Validation Rules

The statements are almost the same as for RTE.CLS (note the change of RouteAvailability status in „Opening only possible for normally closed routes“) and can be reused.

Normative Statement	Source / ADVR Title	Rule Coverage
As a minimum, in addition to the AIXM mandatory properties gml:validTime and aixm:interpretation, each RouteSegment TEMPDELTA TimeSlice shall contain at least one aixm:RouteAvailability with at least aixm:status, aixm:direction and aixm:levels specified (not NIL).	DNES 4.7.5 / minimal data requirements	TBD
For each RouteSegment TEMPDELTA created by the Event, there should not exist another RouteSegment TEMPDELTA with an overlapping (partially or totally) gml:validTime and containing aixm:RouteAvailability elements.	DNES 4.7.5 / Non-duplication with other Events	TBD
There should exist at least on BASELINE RouteAvailability with status=CLSD or COND for one of the levels and times (if specified in a Baseline schedule) affected by the TEMPDELTA.	DNES 4.7.5 / Opening only possible for normally closed routes	TBD
For each RouteAvailability included in the TEMPDELTA that has an associated annotation with purpose=REMARK and the text="Baseline data copy. Not included in the NOTAM text generation", there shall exist an equivalent RouteAvailability in the BASELINE data, having: • the same aixm:direction, aixm:cardinalDirection and aixm:status; • equal or smaller aixm:levels/lowerLimit value;	DNES 4.7.5 / Baseline data copy correctness	TBD

8.2.6.2 Coverage of Additional Normative Statements

The statements are almost the same as for RTE.CLS (note the change of RouteAvailability status in ER-03) and can be reused.

Normative Statement	Source	Rule Coverage
ER-01: The temporary opening of a route portion shall be encoded as: - a new Event, [...]; - a new TEMPDELTA Timeslice for each individual RouteSegment that is located on the route portion specified in the event data.	DNES 4.7.4	TBD
ER-03: A RouteAvailability object with status=OPEN, direction=BOTH and at least one associated level.AirspaceLayer object shall be included in the Tempdelta Timeslice for each RouteSegment concerned.	DNES 4.7.4	TBD
ER-04: If no lower limit is specified in the Event data, then the associated level.AirspaceLayer should contain the values lowerLimit="FLOOR" (uom=OTHER").	DNES 4.7.4	TBD
ER-05: If no upper limit is specified in the Event data, then the associated level.AirspaceLayer should contain the values lowerLimit="CEILING" (uom=OTHER").	DNES 4.7.4	TBD
ER-06: RouteAvailability associated with the TEMPDELTA completely replaces BASELINE data during the TEMPDELTA time of applicability. Therefore, the other times shall be included in the TEMPDELTA explicitly (summarized, see DNES 4.7.4).	DNES 4.7.4	TBD

8.2.7 Coverage of "Aerodrome Closure" Scenario [AD.CLS]

8.2.7.1 Coverage of Automatic Data Validation Rules

Normative Statement	Source / ADVR Title	Rule Coverage
At least one AirportHeliport must be present and associated to an Event of scenario AD.CLS	Rule originating from this document, but based on section 4.8 of DNES; see “Content Unassociated to the Event” above / Minimal data requirements	dnes-er-4.8-1
As a minimum, in addition to the AIXM mandatory properties gml:validTime and aixm:interpretation, the AirportHeliport TEMPDELTA TimeSlice shall contain at least aixm:sequenceNumber and one aixm:availability element with at least the aixm:operationalStatus descendant element specified (not NIL).	DNES 4.8.5 / Minimal data requirements	dnes-4.8.5-1, dnes-4.8.5-2
For the AirportHeliportAvailability with operationalStatus=CLOSED included in the TEMPDELTA, if aixm:AirportHeliportUsage.operations=ALL, then aixm:priorPermission and/or aixm:type shall be specified (not NIL)	DNES 4.8.5 / "ALL" operations only if additional conditions	dnes-4.8.5-3
If aixm:AirportHeliportUsage.priorPermission is specified, then the aixm:AirportHeliportUsage.type shall be "CONDITIONAL"	DNES 4.8.5 / PPR only if "CONDITIONAL"	dnes-4.8.5-4
For the AirportHeliportAvailability with operationalStatus=CLOSED included in the TEMPDELTA, any eventual child aixm:AirportHeliportUsage.type cannot have any other type than "PERMIT" or "CONDITIONAL".	DNES 4.8.5 / Only "PERMIT" or conditional "CONDITIONAL" allowed in relation with a closure	dnes-4.8.5-5

Normative Statement	Source / ADVR Title	Rule Coverage
If aixm:AirportHeliportUsage.type is specified (not NIL), then at least one aixm:selection shall be specified (not NIL)	DNES 4.8.5 / "PERMIT" or "CONDITIONAL" require aircraft or flight	dnes-4.8.5-6
Only the following properties of AircraftCharacteristics can be used in this scenario: ● type ● engine ● wingSpan and wingSpanInterpretation ● weight and weightInterpretation	DNES 4.8.5 / Aircraft characteristics consistent with scenario	dnes-4.8.5-7
For each AirportHeliportAvailability included in the TEMPDELTA that has operationalStatus=NORMAL and an associated annotation with purpose=REMARK and the text="Baseline data copy. Not included in the NOTAM text generation", there shall exist an equivalent AirportHeliportAvailability in the BASELINE data, having: ● the same aixm:operationalStatus and aixm:warning values; ● the same aixm:usage (complex property); ● an encompassing aixm:timeInterval.	DNES 4.8.5 / Baseline data copy correctness	TBD Requires BASELINE timeslice to be present

8.2.7.2 Coverage of Additional Normative Statements

Normative Statement	Source	Rule Coverage
ER-02: One AirportHeliportAvailability element having operationalStatus=CLOSED shall be included in the TEMPDELTA.	DNES 4.8.4	TBD

Normative Statement	Source	Rule Coverage
ER-02: If the airport/heliport is "closed except for" specified operations, flight and/or aircraft categories, all specified excepted operations shall be encoded as AirportHeliportUsage child elements with: • either type=PERMIT, if there is no prior permission requirement; • or type=CONDITIONAL, if a prior permission requirement was specified. Note that this implies that a "closed" airport/heliport can still allow certain particular operations.	DNES 4.8.4	TBD
ER-03: If a unique flight or aircraft are specified as being excepted, they shall be encoded as one ConditionCombination with logicalOperator="NONE".	DNES 4.8.4	TBD
ER-04: Each pair of flight and aircraft conditions specified as being excepted shall be encoded as one ConditionCombination with logicalOperator="AND".	DNES 4.8.4	TBD
ER-05: If the "other combination" branch is used, then a root ConditionCombinations element shall be encoded having logicalOperator="OR" and each pair of flight/aircraft included as a sub-condition (with logicalOperator="AND", see ER-04).	DNES 4.8.4	TBD
ER-06: If the airport closure is limited to a discrete schedule within the overall time period between the "start time" and the "end time", then this shall be encoded using as many as necessary timeInterval/Timesheet properties for the AirportHeliportAvailability of the AirportHeliport TEMPDELTA Timeslice. See the rules for Event Schedules.	DNES 4.8.4	TBD
ER-07: In accordance with the AIXM Temporality Concept [...], the AirportHeliportAvailability elements included in the TEMPDELTA completely replace all the BASELINE	DNES 4.8.4	TBD

Normative Statement	Source	Rule Coverage
AirportHeliportAvailability information, during the TEMPDELTA time of applicability. Therefore, if the closure only concerns certain times, then the other times, when the airport/heliport eventually remains subject to the availability conditions of the Baseline data, shall be explicitly included in the TEMPDELTA. [...] All AirportHeliportAvailabilty elements that are copied from the BASELINE data for completeness sake shall get an associated Note with purpose=REMARK and the text="Baseline data copy. Not included in the NOTAM text generation".		

8.2.8 Coverage of "Runway Closure" Scenario [RWY.CLS]

8.2.8.1 Coverage of Automatic Data Validation Rules

Normative Statement	Source / ADVR Title	Rule Coverage
At least one RunwayDirection must be present and associated to an Event of scenario RWY.CLS	See "Content Unassociated to the Event" above / Minimal data requirements	dnes-4.9.5-er-1
As a minimum, in addition to the AIXM mandatory properties gml:validTime and aixm:interpretation, each RunwayDirection TEMPDELTA TimeSlice shall contain at least aixm:sequenceNumber and one aixm:availability element with at least the aixm:operationalStatus descendant element specified (not NIL).	DNES 4.9.5 / Minimal data requirements	dnes-4.9.5-1, dnes-4.9.5-2
For the ManoeuvringAreaAvailability with operationalStatus=CLOSED included in the	DNES 4.9.5 / "ALL" operations	dnes-4.9.5-3

Normative Statement	Source / ADVR Title	Rule Coverage
TEMPDELTA, if aixm:ManoeuvringAreaUsage.operations=ALL, then aixm:priorPermission and/or aixm:type shall be specified (not NIL)	only if additional conditions	
If aixm:ManoeuvringAreaUsage.priorPermission is specified, then the aixm:ManoeuvringAreaUsage.type shall be "CONDITIONAL"	DNES 4.9.5 / PPR only if "CONDITIONAL"	dnes-4.9.5-4
For the ManoeuvringAreaAvailability with operationalStatus=CLOSED included in the TEMPDELTA, any eventual child aixm:ManoeuvringAreaUsage.type cannot have any other type than "PERMIT" or "CONDITIONAL".	DNES 4.9.5 / Only "PERMIT" or conditional "CONDITIONAL" allowed in relation with a closure	dnes-4.9.5-5
If aixm:ManoeuvringAreaUsage.type is specified (not NIL), then at least one aixm:selection shall be specified (not NIL)	DNES 4.9.5 / "PERMIT" or "CONDITIONAL" require aircraft or flight	dnes-4.9.5-6
Only the following properties of AircraftCharacteristics can be used in this scenario: • type • engine • wingSpan and wingSpanInterpretation • weight and weightInterpretation	DNES 4.9.5 / Aircraft characteristics consistent with scenario	dnes-4.9.5-7
For each ManoeuvringAreaAvailability included in the TEMPDELTA that has operationalStatus=NORMAL and an associated annotation with purpose=REMARK and the text="Baseline data copy. Not included in the	DNES 4.9.5 / Baseline data copy correctness	TBD Requires BASELINE timeslice to be

Normative Statement	**Source / ADVR Title**	**Rule Coverage**
NOTAM text generation", there shall exist an equivalent ManoeuvringAreaAvailability in the BASELINE data, having: • the same aixm:operationalStatus and aixm:warning values; • the same aixm:usage (complex property); • an encompassing aixm:timeInterval		present
If more than one RunwayDirection has a TEMPDELTA TimeSlice associated with the Event (the runway itself is closed), then these TEMPDELTA shall have identical ManoeuvringAreaAvailability child elements. This rule concerns only the ManoeuvringAreaAvailability elements that are not copied from the BASELINE data - they do not have operationalStatus=NORMAL and do not have an associated annotation with purpose=REMARK and the text="Baseline data copy. Not included in the NOTAM text generation".	DNES 4.9.5 / Identical closure for all runway directions	TBD e.g. one approach would be to perform aggregate queries of the nodes to ensure there isn't variance between the runway directions (do a count of different runway directions and the count should be 1) As XPath has limited support for aggregation across nodes this could not be tested with Schematron alone.

8.2.8.2 Coverage of Additional Normative Statements

Normative Statement	Source	Rule Coverage
ER-01: in case a full runway is concerned by the closure, then a TEMPDELTA shall be encoded for each of its RunwayDirections.	DNES 4.9.4	This statement is normative for operators. Automated tests cannot check this if they do not have knowledge of the event that triggered RunwayDirections to be closed. What can be recognized is that multiple RunwayDirection Tempdeltas are provided and that their usedRunway is identical - this would give a hint that the full runway is closed. See automatic data validation rule “Identical closure for all runway directions” for further details.
ER-02: One ManoeuvringAreaAvailability element having operationalStatus=CLOSED shall be included in each RunwayDirection TEMPDELTA. If the runway is "closed except for" specified operations, flight and/or aircraft categories, all specified excepted operations shall be encoded as ManoeuvringAreaUsage child elements with: • either type=PERMIT, if there is no prior permission requirement; • or type=CONDITIONAL, if a prior permission requirement was specified.	DNES 4.9.4	TBD

Normative Statement	Source	Rule Coverage
Note that this implies that a "closed" runway can still allow certain particular operations.		
ER-03: If a unique flight or aircraft are specified as being excepted, they shall be encoded as one ConditionCombination with logicalOperator="NONE".	DNES 4.9.4	TBD
ER-04: Each pair of flight and aircraft conditions specified as being excepted shall be encoded as one ConditionCombination with logicalOperator="AND".	DNES 4.9.4	TBD
ER-05: If the "other combination" branch is used, then a root ConditionCombinations element shall be encoded having logicalOperator="OR" and each pair of flight/aircraft included as a sub-condition (with logicalOperator="AND", see ER-04).	DNES 4.9.4	TBD
ER-06: If the runway closure is limited to a discrete schedule within the overall time period between the "start time" and the "end time", then this shall be encoded using as many as necessary timeInterval/Timesheet properties for the ManoeuvringAreaAvailability of the RunwayDirection TEMPDELTA Timeslice. See the rules for Event Schedules.	DNES 4.9.4	TBD
ER-07: In accordance with the AIXM Temporality Concept [...], the ManoeuvringAreaAvailability elements included in the TEMPDELTA completely replace all the BASELINE ManoeuvringAreaAvailability information, during the TEMPDELTA time of applicability. Therefore, if the closure only concerns certain times, then the other times, when the runway eventually remains subject to the	DNES 4.9.4	TBD

Normative Statement	Source	Rule Coverage
availability conditions of the Baseline data, shall be explicitly included in the TEMPDELTA. [...] All ManoeuvringAreaAvailability elements that are copied from the BASELINE data for completeness sake shall get an associated Note with purpose=REMARK and the text="Baseline data copy. Not included in the NOTAM text generation".		

8.2.9 Coverage of "Navaid Unserviceable" Scenario [NAV.UNS]

8.2.9.1 Coverage of Automatic Data Validation Rules

Normative Statement	Source / ADVR Title	Rule Coverage
At least one Navaid, NavaidEquipment or appropriate subclass must be present and associated to an Event of scenario NAV.UNS	At least one Navaid, NavaidEquipment or appropriate subclass must be present and associated to an Event of scenario NAV.UNS rule originating from this document, but based on section 4.10 of DNES; see section "Content Unassociated to the Event" above / Minimal data requirements	dnes-er-4.10-1

Normative Statement	Source / ADVR Title	Rule Coverage
Navaid and NavaidEquipment TEMPDELTA TimeSlice shall contain at least aixm:availability/aixm:NavaidOperationalStatus/aixm:operationalStatus	DNES 4.10.5 / Minimal data requirements	dnes-4.10.5-1
The TEMPDELTA TimeSlice of a NavaidEquipment associated with the Event cannot have the values "FALSE_POSSIBLE" or "CONDITIONAL" for its aixm:operationalStatus.	DNES 4.10.5 / Operational status allowed values	dnes-4.10.5-2
The value "PARTIAL" can appear only in a TEMPDELTA TimeSlice of a TACAN associated with the Event and only if the signalType has one of the values: "AZIMUTH" or "DISTANCE".	DNES 4.10.5 / Operational status PARTIAL only for TACAN	dnes-4.10.5-3
If a Navaid (BASELINE) has a single aixm:navaidEquipment and there exists a TEMPDELTA TimeSlice for that NavaidEquipment that has aixm:operationalStatus with one of the values UNSERVICEABLE, ONTEST, INTERRUPT, PARTIAL, FALSE_INDICATION, DISPLACED or OTHER, then the Navaid shall also have a TEMPDELTA TimeSlice with identical validity time and identical aixm:NavaidOperationalStatus data	DNES 4.10.5 / Single component Navaid status consistency	Requires BASELINE timeslice to be present
If a VOR that is used (by xlink:href) as aixm:navaidEquipment for a Navaid of type VOR/DME has a TEMPDELTA TimeSlice with aixm:operationalStatus with one of the values UNSERVICEABLE, ONTEST, INTERRUPT, FALSE_INDICATION, DISPLACED, OTHER or IN_CONSTRUCTION, then the VOR/DME Navaid shall also have a TEMPDELTA TimeSlice with identical validity time, aixm:type="DME" and aixm:operationalStatus according to the mapping table of the rule ER-09	DNES 4.10.5 / VOR/DME status consistency with VOR	dnes-4.10.5-4, dnes-4.10.5-5, dnes-4.10.5-6

Normative Statement	Source / ADVR Title	Rule Coverage
If a DME that is used (by xlink:href) as aixm:navaidEquipment for a Navaid of type VOR/DME has a TEMPDELTA TimeSlice with aixm:operationalStatus with one of the values UNSERVICEABLE, ONTEST, INTERRUPT, FALSE_INDICATION, DISPLACED, OTHER or IN_CONSTRUCTION, then the VOR/DME Navaid shall also have a TEMPDELTA TimeSlice with identical validity time, aixm:type="VOR" and aixm:operationalStatus according to the mapping table of the rule ER-09	DNES 4.10.5 / VOR/DME status consistency with DME	dnes-4.10.5-7, dnes-4.10.5-8, dnes-4.10.5-9
If a Localizer that is used (by xlink:href) as aixm:navaidEquipment for a Navaid of type ILS or ILS/DME has a TEMPDELTA TimeSlice with aixm:operationalStatus with one of the values UNSERVICEABLE, ONTEST, INTERRUPT, FALSE_INDICATION, DISPLACED, OTHER or IN_CONSTRUCTION, then the ILS or ILS/DME Navaid shall also have a TEMPDELTA TimeSlice with identical validity time, aixm:type="OTHER" and aixm:operationalStatus according to the mapping table of the rule ER-09	DNES 4.10.5 / ILS status consistency with Localizer	dnes-4.10.5-10, dnes-4.10.5-11, dnes-4.10.5-12
If a Glidepath that is used (by xlink:href) as aixm:navaidEquipment for a Navaid of type ILS or ILS/DME has a TEMPDELTA TimeSlice with aixm:operationalStatus with one of the values UNSERVICEABLE, ONTEST, INTERRUPT, FALSE_INDICATION, DISPLACED, OTHER or IN_CONSTRUCTION, then the ILS or ILS/DME Navaid shall also have a TEMPDELTA TimeSlice with identical validity time, aixm:type="LOC" or "LOC_DME" and aixm:operationalStatus according to the mapping table of the rule ER-09	DNES 4.10.5 / ILS status consistency with Glidepath	dnes-4.10.5-13, dnes-4.10.5-14, dnes-4.10.5-15
If the Navaid or NavaidEquipment TEMPDELTA TimeSlice includes an aixm:availability, then there should not exist any other TEMPDELTA for the	DNES 4.10.5 / A single temporary	dnes-4.10.5-16

Normative Statement	Source / ADVR Title	Rule Coverage
same Navaid or NavaidEquipment that also includes an aixm:availability element and which intersects the validity of the current TEMPDELTA.	operational status	
For each NavaidOperationalStatus included in the TEMPDELTA that has an associated annotation with purpose=REMARK and the text="Baseline data copy. Not included in the NOTAM text generation", there shall exist an equivalent NavaidOperationalStatus in the BASELINE data, having: • the same aixm:operationalStatus and aixm:signalType (if applicable); • an encompassing aixm:timeInterval	DNES 4.10.5 / Baseline data copy correctness	TBD Requires BASELINE timeslice to be present

8.2.9.2 Coverage of Additional Normative Statements

Normative Statement	Source	Rule Coverage
ER-03: For each Navaid(s) which use one or more of the NavaidEquipment identified applying ER-02 (basically any NavaidEquipment with Tempdelta that points to dnotam:Event): encode a new TimeSlice of type TEMPDELTA, in which the "event:theEvent" property points to the Event instance created according to ER-01. The TEMPDELTA shall contain containing at least one NavaidOperationalStatus.	DNES 4.10.4	TBD
ER-06: The value "UNSERVICEABLE" shall be used only if the navaid does not emit any signal. Otherwise, the value "ON_TEST" shall be used	DNES 4.10.4	TBD

Normative Statement	Source	Rule Coverage
ER-07: In the case of a Navaid for which all its primary components NavaidEquipment are affected (have a temporarily changed operational status), then its NavaidOperationalStatus.operationalStatus attribute shall get the value specified by the "operational status" input parameter.	DNES 4.10.4	TBD
ER-08: In the case of a Navaid for which only some of its components NavaidEquipment are affected (have a temporarily changed operational status) but not all, then the TEMPDELTA TimeSlice of the Navaid shall have the value indicated in the following table (priority from top to bottom): ...	DNES 4.10.4	TBD
ER-09: In the case of a Navaid that has more than one NavaidEquipment component, if only some of its primary components NavaidEquipment are affected (have a temporarily changed operational status = UNSERVICEABLE, ON_TEST, FALSE_INDICATION or IN_CONSTRUCTION) but not all, then it is possible that the unavailability of one of the components changes the nature of the navaid service. If this is the case, then the TEMPDELTA TimeSlice encoded for the Navaid shall also temporarily change the type of the Navaid. For example, if the DME component of a VOR/DME navaid is unserviceable, then the Navaid TEMPDELTA TimeSlice shall also indicate that type="VOR" only and the operationalStatus shall be "PARTIAL". The table below provides more detailed rules:	DNES 4.10.4	TBD
ER-10: If the Navaid or NavaidEquipment status change is limited to a discrete schedule	DNES	TBD - appears to require that the schematron rules can

Normative Statement	Source	Rule Coverage
within the overall time period between the "start time" and the "end time", then this shall be encoded using as many as necessary timeInterval/Timesheet properties for the NavaidOperationalStatus of their TEMPDELTA Timeslice. See also the rules for Event Schedules	4.10.4	detect that the sum of schedules of all Navaid.availability / NavaidEquipment.availability properties cover the whole validity time of the respective Tempdelta; this appears to be quite complex unless a specific function was designed to check this constrain
ER-11: In accordance with the AIXM Temporality Concept [...], the NavaidOperationalStatus associated with the TEMPDELTA replaces all the BASELINE NavaidOperationalStatus information, during the TEMPDELTA time of applicability. Therefore, if the modified operational status only concerns certain times, the other times when the navaid or equipment eventually remains with the same status as in the Baseline data, shall be explicitly included in the TEMPDELTA. [...] All NavaidOperationalStatus elements that are copied from the BASELINE data for completeness sake shall get an associated Note with purpose=REMARK and the text="Baseline data copy. Not included in the NOTAM text generation".	DNES 4.10.4	TBD

8.2.10 Coverage of "New Obstacle" Scenario [OBS.NEW]

8.2.10.1 Coverage of Automatic Data Validation Rules

Normative Statement	Source / ADVR Title	Rule Coverage

Normative Statement	Source / ADVR Title	Rule Coverage
As a minimum, in addition to the AIXM mandatory properties gml:validTime and aixm:interpretation, the VerticalStructure BASELINE TimeSlice shall contain at least aixm:sequenceNumber, aixm:type, aixm:lighted and one aixm:part.	DNES 4.7.5 / Minimal data requirements	TBD
If aixm:group="YES" and the VerticalStructure position intersects the horizontal projection of Area 2 of an airport, then aixm:part/aixm:VerticalStructurePart shall have horizontalProjection_surfaceExtent geometry and the associated ElevatedSurface shall have aixm:elevation	DNES 4.7.5 / Area for obstacle group at airport	TBD
If aixm:mobile="YES" and the VerticalStructure position intersects the horizontal projection of Area 2 of an airport, then aixm:part/aixm:VerticalStructurePart shall have horizontalProjection_surfaceExtent geometry and the associated ElevatedSurface shall have aixm:elevation	DNES 4.7.5 / Area for mobile obstacle at airport	TBD
If the aixm:part/aixm:VerticalStructurePart has horizontalProjection_linearExtent geometry, then the associated ElevatedCurve shall have aixm:elevation	DNES 4.7.5 / Obstacle line elevation	TBD
If the aixm:part/aixm:VerticalStructurePart does have neither horizontalProjection_linearExtent nor horizontalProjection_linearExtent geometry, then it shall have horizontalProjection_location geometry and the associated ElevatedPoint shall have aixm:elevation	DNES 4.7.5 / Point if not area or line	TBD

8.2.10.2 Coverage of Additional Normative Statements

Normative Statement	Source	Rule Coverage
ER-01: The new obstacle shall be encoded as: - a new Event, [...]; - a new VerticalStructurem, for which PERMDELTA and subsequent BASELINE TimeSlices shall be created; the property "event:theEvent" of the VerticalStructure TimeSlices shall refer to the Event mentioned above.	DNES 4.11.4	TBD
ER-02: If the obstacle consists of a group of similar obstacles situated close to each other for which the individual positions/extents cannot be provided, then: - if the obstacle is situated in the horizontal projection of Area 2 of an airport, then the overall extent of the obstacle group shall be provided as a surface extent; - if the obstacle is not situated in the horizontal projection of Area 2 of an airport, then it is also acceptable to provide a single lat/long position for the whole group. In both situations, the "group" property of the VerticalStructure shall get the value "YES".	DNES 4.11.4	TBD
ER-03: If the obstacle can change position or has mobile parts (such as a crane arm), then: - if the obstacle is situated in the horizontal projection of Area 2 of an airport, then the overall area in which the obstacle or any part of it can be located shall be provided as a surface extent; - if the obstacle is not situated in the horizontal projection of Area 2 of an airport, then it is also acceptable to provide a single lat/long position for the obstacle. In both situation, the "mobile" property of	DNES 4.11.4	TBD

Normative Statement	Source	Rule Coverage
the VerticalStructure shall get the value "YES".		
ER-04: The type of the obstacle shall be encoded (same value) both in the VerticalStructure.type and in the VerticalStructurePart.type	DNES 4.11.4	TBD

8.2.11 Coverage of "Withdrawn Obstacle", "Taxiway Closure" and "Airport Surface Contamination" Scenarios

These scenarios were not yet available in the DNES used in OWS-8. At the end of the testbed, early drafts of the scenarios were provided to participants. However, it was agreed that these drafts were not sufficiently developed to be used for the validation work in OWS-8. They shall be included in future validation efforts.

8.2.12 Coverage of "Other Event" Scenario [OTHER]

8.2.12.1 Coverage of Automatic Data Validation Rules

Not available in current DNES.

8.2.12.2 Coverage of Additional Normative Statements

Normative Statement	Source	Rule Coverage
1. the text NOTAM shall be created as usual; 2. a new Event (encoding="ANNOTATION") shall be created, including the associated NOTAM class with the NOTAM text; 3. a new Tempdelta TimeSlice shall be created for the affected feature, referring the Event; this shall have: ○ the text of the NOTAM (only the information from items D, E, F and G) as a Note with purpose "warning". Eventually, a specific feature property could be specified	DNES 4.15.2	Interpreted into the individual validation statements below. Statements related to validating TEMPDELTA's against BASELINE information is not tested with the schematron.

Normative Statement	Source	Rule Coverage
by the operator ○ in the case of a non-PERM NOTAM, the same validity as the NOTAM (could be estimated); ○ an "undetermined" end of validity in the case of a PERM NOTAM; once the NOTAM is cancelled because the information is put in an AIP AMDT, a correction TimeSlice shall be issued with the appropriate end of validity		
At least one feature associated to the “OTHER” event must be present.	Rule originating from this document, but based on section 4.15 of DNES; see “Content Unassociated to the Event” above / Minimal data requirements	dnes-er-4.15.2.1
OTHER events must have an encoding of ANNOTATION.	DNES 4.15.2	dnes-4.15.2-1
OTHER events must include a textNOTAM/NOTAM/text element (not NIL).	DNES 4.15.2	dnes-4.15.2-2
All features that are associated to the OTHER event will include a note of purpose WARNING with matching text to the textNOTAM/NOTAM/text element of the event.	DNES 4.15.2	dnes-4.15.2-3, dnes-4.15.2.4

9 Annex B – Schematron Rules

This Annex contains the schematron rules developed in OWS-8 for validating the DNES. This file is also posted at: http://dp.schemas.opengis.net/11-092r2

```
<?xml version="1.0" encoding="UTF-8"?>
<schema xmlns="http://purl.oclc.org/dsdl/schematron"
xmlns:sch="http://purl.oclc.org/dsdl/schematron">
   <title>Schematron constraints that check an AIXMBasicMessage is
structurally conformant to a Digital NOTAM message.</title>
   <!--
       The first pattern covers general DNES validation.

       Each pattern after this targets a DNES scenario, organised into
alphabetical order of the scenario code.
    -->
   <ns prefix="sch" uri="http://purl.oclc.org/dsdl/schematron"/>
   <ns prefix="gml" uri="http://www.opengis.net/gml/3.2" />
   <ns prefix="aixm" uri="http://www.aixm.aero/schema/5.1" />
   <ns prefix="event" uri="http://www.aixm.aero/schema/5.1/event" />
   <ns prefix="message" uri="http://www.aixm.aero/schema/5.1/message"
/>
   <ns prefix="xlink" uri="http://www.w3.org/1999/xlink" />

   <pattern name="Digital NOTAM events - general validation">
      <!-- Rule: Event members of the message -->
      <rule context="//event:Event">
         <let name="scenario"
value="event:timeSlice/event:EventTimeSlice/event:scenario"/>
         <let name="dnesVersion" value="'1.0'"/>
         <!-- Each Event must include a scenario attribute -->
         <assert id="dnes-3.4-1" test="$scenario">
            A digital NOTAM event must include a scenario attribute.
            <value-of select="name()" /> ID: <value-of
select="@gml:id" />
         </assert>

         <!--
            In an AIXM file that contains an event encoding, the
identifier shall
            also include the version of the Event Specification
according to which
            the encoding was done.
         -->
         <assert id="dnes-2.5-1" test="contains($scenario,
$dnesVersion)">
            Found an event with a version that doesn't match this
validator.
            <value-of select="name()" /> ID: <value-of
select="@gml:id" />
            Version expected: <value-of select="$dnesVersion" />
            Version found: <value-of select="$scenario" />
         </assert>
```

```
         <!-- the scenario attribute should be one of the following
(perhaps later this should use the codespace mechanism? -->
         <assert id="dnes-3.4-2"
test="contains('SAA.ACT.$dnesVersion,ATSA.ACT.$dnesVersion,SAA.NEW.$dne
sVersion,ATSA.NEW.$dnesVersion,RTE.CLS.$dnesVersion,RTE.OPN.$dnesVersio
n,AD.CLS.$dnesVersion,RWY.CLS.$dnesVersion,NAV.UNS.$dnesVersion,OBS.NEW
.$dnesVersion,OBS.WDN.$dnesVersion,TWY.CLS.$dnesVersion,AD.CONT.$dnesVe
rsion,OTHER.$dnesVersion', @scenario)">
            <value-of select="$scenario"/> is not a valid scenario.
            <value-of select="name()" /> ID: <value-of
select="@gml:id" />
         </assert>
      </rule>
   </pattern>


   <!-- Scenario: Aerodrome Closure - AD.CLS -->
   <pattern name="Digital NOTAM events - Scenario: Aerodrome Closure">
      <!-- Rule: Event for this scenario -->
      <rule context="//event:Event[starts-
with(event:timeSlice/event:EventTimeSlice/event:scenario,'AD.CLS')]">
         <!-- At least one AirportHeliport must be present and
associated to an Event of scenario AD.CLS -->
         <assert id="dnes-er-4.8-1" test="concat('#',@gml:id) =
(//aixm:AirportHeliport)/descendant::aixm:extension/*/event:theEvent/@x
link:href">
            An Aerodrome Closure scenario must include at least one
AirportHeliport.
            Event ID: <value-of select="@gml:id" />
         </assert>
      </rule>

      <!-- Rule: TEMPDELTA time slice of any airportheliport associated
to this event -->
      <rule
context="//aixm:timeSlice[../../aixm:AirportHeliport][descendant::event
:theEvent/@xlink:href = concat('#',//event:Event[starts-
with(event:timeSlice/event:EventTimeSlice/event:scenario,'AD.CLS')]/@gm
l:id)][*/aixm:interpretation = 'TEMPDELTA']/child::*">
         <let name="featureId" value="../../@gml:id"/>
         <let name="elementName" value="local-name(../..)"/>
         <let name="opStatus"
value="aixm:availability/aixm:AirportHeliportAvailability/aixm:operatio
nalStatus"/>

         <!--
            As a minimum, in addition to the AIXM mandatory properties
gml:validTime and
            aixm:interpretation, the AirportHeliport TEMPDELTA
TimeSlice shall contain at
            least aixm:sequenceNumber and one aixm:availability
element with at least the
            aixm:operationalStatus descendant element specified (not
NIL).
          -->
```

```
            <assert id="dnes-4.8.5-1" test="aixm:sequenceNumber">
                The AirportHeliport TEMPDELTA TimeSlice shall contain a
sequenceNumber.
                Name: <value-of select="name()" />
                ID: <value-of select="$featureId" />
            </assert>
            <assert id="dnes-4.8.5-2" test="$opStatus">
                The AirportHeliport TEMPDELTA TimeSlice shall contain an
operationalStatus.
                Name: <value-of select="name()" />
                ID: <value-of select="$featureId" />
            </assert>

            <!--
                For the AirportHeliportAvailability with
operationalStatus=CLOSED
                included in the TEMPDELTA, if
aixm:AirportHeliportUsage.operations=ALL,
                then aixm:priorPermission and/or aixm:type shall be
specified (not NIL)
            -->
            <let name="testClosedAll" value="$opStatus='CLOSED' and
aixm:availability/aixm:AirportHeliportAvailability/aixm:usage/aixm:Airp
ortHeliportUsage/aixm:operation='ALL'"/>
            <assert id="dnes-4.8.5-3" test="not($testClosedAll) or
($testClosedAll and
(aixm:availability/aixm:AirportHeliportAvailability/aixm:usage/aixm:Air
portHeliportUsage/aixm:type or
aixm:availability/aixm:AirportHeliportAvailability/aixm:usage/aixm:Airp
ortHeliportUsage/aixm:priorPermission))">
                If the AirportHeliport TEMPDELTA is CLOSED for ALL
operations, then either priorPermission or type must appear in the
usage
                ID: <value-of select="$featureId" />
            </assert>

            <!--
                If aixm:AirportHeliportUsage.priorPermission is specified,
then the
                aixm:AirportHeliportUsage.type shall be "CONDITIONAL"
             -->
            <assert id="dnes-4.8.5-4"
test="not(aixm:availability/aixm:AirportHeliportAvailability/aixm:usage
/aixm:AirportHeliportUsage/aixm:priorPermission) or
(aixm:availability/aixm:AirportHeliportAvailability/aixm:usage/aixm:Air
portHeliportUsage/aixm:priorPermission and
aixm:availability/aixm:AirportHeliportAvailability/aixm:usage/aixm:Airp
ortHeliportUsage[aixm:type='CONDITIONAL'])">
                If aixm:AirportHeliportUsage.priorPermission is specified,
then the aixm:AirportHeliportUsage.type shall be "CONDITIONAL"
                ID: <value-of select="$featureId" />
            </assert>

            <!--
```

```
            For the AirportHeliportAvailability with
operationalStatus=CLOSED
            included in the TEMPDELTA, any eventual child
            aixm:AirportHeliportUsage.type cannot have any other type
than
            "PERMIT" or "CONDITIONAL".
         -->
         <assert id="dnes-4.8.5-5" test="not($opStatus='CLOSED') or
($opStatus='CLOSED' and
contains('CONDITIONAL,PERMIT',aixm:availability/aixm:AirportHeliportAva
ilability/aixm:usage/aixm:AirportHeliportUsage/aixm:type))">
            For the AirportHeliportAvailability with
operationalStatus=CLOSED included in the TEMPDELTA, any eventual child
aixm:AirportHeliportUsage.type cannot have any other type than "PERMIT"
or "CONDITIONAL".
            ID: <value-of select="$featureId" />
         </assert>

         <!--
            If aixm:AirportHeliportUsage.type is specified (not NIL),
then
            at least one aixm:selection shall be specified (not NIL)
         -->
         <assert id="dnes-4.8.5-6"
test="not(aixm:availability/aixm:AirportHeliportAvailability/aixm:usage
/aixm:AirportHeliportUsage/aixm:type) or
(aixm:availability/aixm:AirportHeliportAvailability/aixm:usage/aixm:Air
portHeliportUsage/aixm:type and
aixm:availability/aixm:AirportHeliportAvailability/aixm:usage/aixm:Airp
ortHeliportUsage/aixm:selection)">
            If aixm:AirportHeliportUsage.type is specified (not NIL),
then at least one aixm:selection shall be specified (not NIL)
            ID: <value-of select="$featureId" />
         </assert>

         <!--
            Only the following properties of AircraftCharacteristics
can be used in this
            scenario: type, engine, wingSpan and
wingSpanInterpretation, weight and
            weightInterpretation
         -->
         <assert id="dnes-4.8.5-7"
test="not(aixm:availability/aixm:AirportHeliportAvailability/aixm:usage
/aixm:AirportHeliportUsage/aixm:selection/descendant::aixm:AircraftChar
acteristic[not(aixm:type | aixm:engine | aixm:wingSpan |
aixm:wingSpanInterpretation | aixm:weight |
aixm:weightInterpretation)])">
            Only the following properties of AircraftCharacteristics
can be used in this scenario: type, engine, wingSpan and
wingSpanInterpretation, weight and weightInterpretation.
            Name: <value-of
select="name(aixm:availability/aixm:AirportHeliportAvailability/aixm:us
age/aixm:AirportHeliportUsage/aixm:selection/descendant::aixm:AircraftC
haracteristic/*)" />
```

```
            ID: <value-of select="$featureId" />
         </assert>
      </rule>
   </pattern>


   <!-- Scenario: Navaid Unservicable - NAV.UNS -->
   <pattern name="Digital NOTAM events - Scenario: Navaid
Unservicable">
      <!-- Rule: Event for this scenario -->
      <rule context="//event:Event[starts-
with(event:timeSlice/event:EventTimeSlice/event:scenario,'NAV.UNS')]">
         <!-- At least one Navaid, NavaidEquipment or appropriate
subclass must be present and associated to an Event of scenario NAV.UNS
-->
         <assert id="dnes-er-4.10-1" test="concat('#',@gml:id) =
(//aixm:Navaid | //aixm:NavaidEquipment | //aixm:DME |
//aixm:MarkerBeacon | //aixm:NDB | //aixm:SDF | //aixm:TACAN |
//aixm:VOR)/descendant::aixm:extension/*/event:theEvent/@xlink:href">
            A Navaid Unservicable scenario must include at least one
AIXM Navaid, NavaidEquipment or NavaidEquipment subclass such as TACAN
or VOR.
            Event ID: <value-of select="@gml:id" />
         </assert>
      </rule>

      <!-- Rule: TEMPDELTA time slice of any navaid associated to this
event -->
      <rule context="//aixm:timeSlice[../../aixm:Navaid |
../../aixm:NavaidEquipment | ../../aixm:DME | ../../aixm:MarkerBeacon |
../../aixm:NDB | ../../aixm:SDF | ../../aixm:TACAN |
../../aixm:VOR][descendant::event:theEvent/@xlink:href =
concat('#',//event:Event[starts-
with(event:timeSlice/event:EventTimeSlice/event:scenario,'NAV.UNS')]/@g
ml:id)][*/aixm:interpretation = 'TEMPDELTA']/child::*">
         <let name="featureId" value="../../@gml:id"/>
         <let name="elementName" value="local-name(../..)"/>
         <let name="opStatus"
value="aixm:availability/aixm:NavaidOperationalStatus/aixm:operationalS
tatus"/>
         <let name="navaidElement"
value="//aixm:Navaid[aixm:timeSlice/aixm:NavaidTimeSlice/aixm:navaidEqu
ipment/aixm:NavaidComponent/aixm:theNavaidEquipment/@xlink:href=concat(
'#',$featureId)]"/>
         <let name="navaidOpStatus"
value="$navaidElement/aixm:timeSlice/aixm:NavaidTimeSlice/aixm:availabi
lity/aixm:NavaidOperationalStatus/aixm:operationalStatus"/>

         <!--
            As a minimum, in addition to the AIXM mandatory properties
gml:validTime and
            aixm:interpretation, the Navaid and NavaidEquipment
TEMPDELTA TimeSlice shall
            contain at least aixm:operationalStatus
```



```
            -->
            <assert id="dnes-4.10.5-1" test="$opStatus">
               The Navaid or navaid equipment TEMPDELTA TimeSlice shall
contain at least operationalStatus.
               Name: <value-of select="name()" />
               ID: <value-of select="$featureId" />
            </assert>

            <!--
               The TEMPDELTA TimeSlice of a NavaidEquipment associated
with the Event cannot
               have the values "FALSE_POSSIBLE" or "CONDITIONAL" for its
aixm:operationalStatus.
            -->
            <assert id="dnes-4.10.5-2"
test="not(contains('FALSE_POSSIBLE,CONDITIONAL',aixm:availability/aixm:
NavaidOperationalStatus/aixm:operationalStatus))">
               The TEMPDELTA TimeSlice of a NavaidEquipment associated
with the Event cannot have the values "FALSE_POSSIBLE" or "CONDITIONAL"
for its aixm:operationalStatus.
               ID: <value-of select="$featureId" />
            </assert>

            <!--
               The value "PARTIAL" can appear only in a TEMPDELTA
TimeSlice of a TACAN
               associated with the Event and only if the signalType has
one of the
               values: "AZIMUTH" or "DISTANCE".
            -->
            <let name="testSignalType" value="'TACAN'=$elementName and
$opStatus='PARTIAL'"/>
            <assert id="dnes-4.10.5-3" test="not($testSignalType) or
($testSignalType and
contains('AZIMUTH,DISTANCE',aixm:availability/aixm:NavaidOperationalSta
tus/aixm:signalType))">
               The value "PARTIAL" can appear only in a TEMPDELTA
TimeSlice of a TACAN associated with the Event and only if the
signalType has one of the values: "AZIMUTH" or "DISTANCE".
               ID: <value-of select="$featureId" />
            </assert>

            <!--
               If a VOR that is used (by xlink:href) as
aixm:navaidEquipment for a Navaid
               of type VOR/DME has a TEMPDELTA TimeSlice with
aixm:operationalStatus with
               one of the values UNSERVICEABLE, ONTEST, INTERRUPT,
FALSE_INDICATION,
               DISPLACED, OTHER or IN_CONSTRUCTION, then the VOR/DME
Navaid shall also have
               a TEMPDELTA TimeSlice with identical validity time,
aixm:type="DME" and
               aixm:operationalStatus according to the mapping table of
the rule ER-09
```

```
            -->
          <let name="testVOR" value="'VOR'=$elementName and
$navaidElement and 'VOR/DME'=$navaidElement/aixm:type and
contains('UNSERVICEABLE,ONTEST,INTERRUPT,FALSE_INDICATION,DISPLACED,OTH
ER,IN_CONSTRUCTION',$navaidOpStatus)"/>
          <assert id="dnes-4.10.5-4" test="not($testVOR) or ($testVOR
and
aixm:timeSlice/aixm:VORTimeSlice/gml:validTime=$navaidElement/descendan
t::aixm:validTime)">
              Navaid VOR equipment present and associated to a Navaid,
but TEMPDELTA time validity doesn't match.
              ID: <value-of select="$featureId" />
          </assert>
          <assert id="dnes-4.10.5-5" test="not($testVOR) or ($testVOR
and aixm:type='DME')">
              Navaid VOR equipment present and associated to a Navaid,
but that Navaid is not of type 'DME'.
              ID: <value-of select="$featureId" />
          </assert>
          <assert id="dnes-4.10.5-6" test="not($testVOR) or ($testVOR
and $navaidOpStatus=$opStatus)">
              Navaid VOR equipment present and associated to a Navaid,
but TEMPDELTA operational status doesn't match.
              ID: <value-of select="$featureId" />
          </assert>

          <!--
              If a DME that is used (by xlink:href) as
aixm:navaidEquipment for a Navaid
              of type VOR/DME has a TEMPDELTA TimeSlice with
aixm:operationalStatus with
              one of the values UNSERVICEABLE, ONTEST, INTERRUPT,
FALSE_INDICATION,
              DISPLACED, OTHER or IN_CONSTRUCTION, then the VOR/DME
Navaid shall also have
              a TEMPDELTA TimeSlice with identical validity time,
aixm:type="VOR" and
              aixm:operationalStatus according to the mapping table of
the rule ER-09
            -->
          <let name="testDME" value="'DME'=$elementName and
$navaidElement and 'VOR/DME'=$navaidElement/aixm:type and
contains('UNSERVICEABLE,ONTEST,INTERRUPT,FALSE_INDICATION,DISPLACED,OTH
ER,IN_CONSTRUCTION',$navaidOpStatus)"/>
          <assert id="dnes-4.10.5-7" test="not($testDME) or ($testDME
and
aixm:timeSlice/aixm:DMETimeSlice/gml:validTime=$navaidElement/descendan
t::aixm:validTime)">
              Navaid DME equipment present and associated to a Navaid,
but TEMPDELTA time validity doesn't match.
              ID: <value-of select="$featureId" />
          </assert>
          <assert id="dnes-4.10.5-8" test="not($testDME) or ($testDME
and aixm:type='VOR')">
```

```
            Navaid DME equipment present and associated to a Navaid,
but that Navaid is not of type 'VOR'.
            ID: <value-of select="$featureId" />
          </assert>
          <assert id="dnes-4.10.5-9" test="not($testDME) or ($testDME
and $navaidOpStatus=$opStatus)">
            Navaid DME equipment present and associated to a Navaid,
but TEMPDELTA operational status doesn't match.
            ID: <value-of select="$featureId" />
          </assert>

          <!--
            If a Localizer that is used (by xlink:href) as
aixm:navaidEquipment for a
            Navaid of type ILS or ILS/DME has a TEMPDELTA TimeSlice
with
            aixm:operationalStatus with one of the values
UNSERVICEABLE, ONTEST,
            INTERRUPT, FALSE_INDICATION, DISPLACED, OTHER or
IN_CONSTRUCTION, then the
            ILS or ILS/DME Navaid shall also have a TEMPDELTA
TimeSlice with identical
            validity time, aixm:type="OTHER" and
aixm:operationalStatus according to
            the mapping table of the rule ER-09
           -->
          <let name="testLocalizer" value="'Localizer'=$elementName and
$navaidElement and contains('ILS,ILS/DME',$navaidElement/aixm:type) and
contains('UNSERVICEABLE,ONTEST,INTERRUPT,FALSE_INDICATION,DISPLACED,OTH
ER,IN_CONSTRUCTION',$navaidOpStatus)"/>
          <assert id="dnes-4.10.5-10" test="not($testLocalizer) or
($testLocalizer and
aixm:timeSlice/aixm:DMETimeSlice/gml:validTime=$navaidElement/descendan
t::aixm:validTime)">
            Navaid Localizer equipment present and associated to a
Navaid, but TEMPDELTA time validity doesn't match.
            ID: <value-of select="$featureId" />
          </assert>
          <assert id="dnes-4.10.5-11" test="not($testLocalizer) or
($testLocalizer and aixm:type='OTHER')">
            Navaid Localizer equipment present and associated to a
Navaid, but that Navaid is not of type 'OTHER'.
            ID: <value-of select="$featureId" />
          </assert>
          <assert id="dnes-4.10.5-12" test="not($testLocalizer) or
($testLocalizer and $navaidOpStatus=$opStatus)">
            Navaid Localizer equipment present and associated to a
Navaid, but TEMPDELTA operational status doesn't match.
            ID: <value-of select="$featureId" />
          </assert>

          <!--
             If a Glidepath that is used (by xlink:href) as
aixm:navaidEquipment for a
```

```
                Navaid of type ILS or ILS/DME has a TEMPDELTA TimeSlice
with
                aixm:operationalStatus with one of the values
UNSERVICEABLE, ONTEST,
                INTERRUPT, FALSE_INDICATION, DISPLACED, OTHER or
IN_CONSTRUCTION, then the
                ILS or ILS/DME Navaid shall also have a TEMPDELTA
TimeSlice with identical
                validity time, aixm:type="LOC" or "LOC_DME" and
aixm:operationalStatus
                according to the mapping table of the rule ER-09
             -->
          <let name="testGlidepath" value="'Glidepath'=$elementName and
$navaidElement and contains('ILS,ILS/DME',$navaidElement/aixm:type) and
contains('UNSERVICEABLE,ONTEST,INTERRUPT,FALSE_INDICATION,DISPLACED,OTH
ER,IN_CONSTRUCTION',$navaidOpStatus)"/>
          <assert id="dnes-4.10.5-13" test="not($testGlidepath) or
($testGlidepath and
aixm:timeSlice/aixm:DMETimeSlice/gml:validTime=$navaidElement/descendan
t::aixm:validTime)">
             Navaid Glidepath equipment present and associated to a
Navaid, but TEMPDELTA time validity doesn't match.
             ID: <value-of select="$featureId" />
          </assert>
          <assert id="dnes-4.10.5-14" test="not($testGlidepath) or
($testGlidepath and contains('LOC,LOC_DME',aixm:type))">
             Navaid Glidepath equipment present and associated to a
Navaid, but that Navaid is not of type 'OTHER'.
             ID: <value-of select="$featureId" />
          </assert>
          <assert id="dnes-4.10.5-15" test="not($testGlidepath) or
($testGlidepath and $navaidOpStatus=$opStatus)">
             Navaid Glidepath equipment present and associated to a
Navaid, but TEMPDELTA operational status doesn't match.
             ID: <value-of select="$featureId" />
          </assert>


          <!--
             If the Navaid or NavaidEquipment TEMPDELTA TimeSlice
includes an
             aixm:availability, then there should not exist any other
TEMPDELTA for the
             same Navaid or NavaidEquipment that also includes an
aixm:availability
             element.
           -->
          <let name="navaidCount"
value="count(//*[@gml:id=$featureId]/aixm:timeSlice/*[aixm:interpretati
on='TEMPDELTA']/aixm:availability)"/>
          <assert id="dnes-4.10.5-16" test="1 = $navaidCount">
             If the Navaid or NavaidEquipment TEMPDELTA TimeSlice
includes an
             aixm:availability, then there should not exist any other
TEMPDELTA for the
```

```
            same Navaid or NavaidEquipment that also includes an
aixm:availability
            element.
            There are <value-of select="$navaidCount" /> with ID:
<value-of select="$featureId" /> and an availability element.
         </assert>

      </rule>
   </pattern>

   <!-- Scenario: Other Event - OTHER -->
   <pattern name="Digital NOTAM events - Scenario: Other Event">
      <!-- Rule: Event for this scenario -->
      <rule context="//event:Event[starts-
with(event:timeSlice/event:EventTimeSlice/event:scenario,'OTHER')]">
         <!-- At least one feature must be present and associated to
an Event of scenario OTHER -->
         <assert id="dnes-er-4.15.2-1" test="concat('#',@gml:id) =
//aixm:extension/*/event:theEvent/@xlink:href">
            An event of scenario OTHER must include at least one
associated feature.
            Event ID: <value-of select="@gml:id" />
         </assert>

         <!--
            OTHER events must have an encoding of ANNOTATION.
          -->
         <assert id="dnes-4.15.2-1"
test="event:timeSlice/event:EventTimeSlice/event:encoding =
'ANNOTATION'">
            OTHER events must have an encoding of ANNOTATION.
            Event ID: <value-of select="@gml:id" />
         </assert>

         <!--
            OTHER events must include a textNOTAM/NOTAM/text element
(not NIL).
          -->
         <assert id="dnes-4.15.2-2"
test="event:timeSlice/event:EventTimeSlice/event:textNOTAM/event:NOTAM/
event:text">
            OTHER events must include a textNOTAM/NOTAM/text element
(not NIL).
            Event ID: <value-of select="@gml:id" />
         </assert>
      </rule>

      <!-- Rule: TEMPDELTA time slice of any feature associated to this
event -->
      <rule
context="//aixm:timeSlice[descendant::event:theEvent/@xlink:href =
concat('#',//event:Event[starts-
with(event:timeSlice/event:EventTimeSlice/event:scenario,'OTHER')]/@gml
:id)][*/aixm:interpretation = 'TEMPDELTA']/child::*">
         <let name="featureId" value="../../@gml:id"/>
```

```
            <let name="elementName" value="local-name(../..)"/>
            <let name="eventId"
value="substring(descendant::event:theEvent/@xlink:href, 2)"/>
            <let name="eventFeature" value="//event:Event[starts-
with(event:timeSlice/event:EventTimeSlice/event:scenario,'OTHER')][@gml
:id = $eventId]"/>

            <!--
                All features that are associated to the OTHER event will
                include a note of purpose WARNING with matching text to
                the textNOTAM/NOTAM/text element of the event.
             -->
            <assert id="dnes-4.15.2-3"
test="aixm:annotation/aixm:Note/aixm:purpose = 'WARNING'">
                Features associated to an event of secnario OTHER must
include an annotation/Note of purpose WARNING.
                Name: <value-of select="name()" />
                ID: <value-of select="$featureId" />
            </assert>
            <assert id="dnes-4.15.2-4"
test="aixm:annotation/aixm:Note/aixm:translatedNote/aixm:LinguisticNote
/aixm:note =
$eventFeature/event:timeSlice/event:EventTimeSlice/event:textNOTAM/even
t:NOTAM/event:text">
                Features associated to an event of secnario OTHER must
include an annotation/Note that matches the textNOTAM/NOTAM/text of the
event.
                Name: <value-of select="name()" />
                ID: <value-of select="$featureId" />
            </assert>

        </rule>
    </pattern>

    <!-- Scenario: Runway Closure - RWY.CLS -->
    <pattern name="Digital NOTAM events - Scenario: Runway Closure">
        <!-- Rule: Event for this scenario -->
        <rule context="//event:Event[starts-
with(event:timeSlice/event:EventTimeSlice/event:scenario,'RWY.CLS')]">
            <!-- At least one RunwayDirection must be present and
associated to an Event of scenario RWY.CLS -->
            <assert id="dnes-er-4.9-1" test="concat('#',@gml:id) =
(//aixm:RunwayDirection)/descendant::aixm:extension/*/event:theEvent/@x
link:href">
                A Runway Closure scenario must include at least one
RunwayDirection.
                Event ID: <value-of select="@gml:id" />
            </assert>
        </rule>

        <!-- Rule: TEMPDELTA time slice of any runway direction
associated to this event -->
        <rule
context="//aixm:timeSlice[../../aixm:RunwayDirection][descendant::event
:theEvent/@xlink:href = concat('#',//event:Event[starts-
```

```
with(event:timeSlice/event:EventTimeSlice/event:scenario,'RWY.CLS')]/@g
ml:id)][*/aixm:interpretation = 'TEMPDELTA']/child::*">
          <let name="featureId" value="../../@gml:id"/>
          <let name="elementName" value="local-name(../..)"/>
          <let name="opStatus"
value="aixm:availability/aixm:ManoeuvringAreaAvailability/aixm:operatio
nalStatus"/>
          <let name="eventId"
value="substring(descendant::event:theEvent/@xlink:href, 2)"/>

          <!--
             As a minimum, in addition to the AIXM mandatory properties
gml:validTime
             and aixm:interpretation, each RunwayDirection TEMPDELTA
TimeSlice shall
             contain at least aixm:sequenceNumber and one
aixm:availability element
             with at least the aixm:operationalStatus descendant
element specified
             (not NIL).
           -->
          <assert id="dnes-4.9.5-1" test="aixm:sequenceNumber">
             The RunwayDirection TEMPDELTA TimeSlice shall contain a
sequenceNumber.
             Name: <value-of select="name()" />
             ID: <value-of select="$featureId" />
          </assert>
          <assert id="dnes-4.9.5-2" test="$opStatus">
             The RunwayDirection TEMPDELTA TimeSlice shall contain an
operationalStatus.
             Name: <value-of select="name()" />
             ID: <value-of select="$featureId" />
          </assert>

          <!--
             For the ManoeuvringAreaAvailability with
operationalStatus=CLOSED
             included in the TEMPDELTA, if
aixm:ManoeuvringAreaUsage.operations=ALL,
             then aixm:priorPermission and/or aixm:type shall be
specified (not NIL)
          -->
          <let name="testClosedAll" value="$opStatus='CLOSED' and
aixm:availability/aixm:ManoeuvringAreaAvailability/aixm:usage/aixm:Mano
euvringAreaUsage/aixm:operation='ALL'"/>
          <assert id="dnes-4.9.5-3" test="not($testClosedAll) or
($testClosedAll and
(aixm:availability/aixm:ManoeuvringAreaAvailability/aixm:usage/aixm:Man
oeuvringAreaUsage/aixm:type or
aixm:availability/aixm:ManoeuvringAreaAvailability/aixm:usage/aixm:Mano
euvringAreaUsage/aixm:priorPermission))">
             If the Manoevuring Area TEMPDELTA is CLOSED for ALL
operations, then either priorPermission or type must appear in the
usage
             ID: <value-of select="$featureId" />
```

```
            </assert>

            <!--
                If aixm:ManoeuvringAreaUsage.priorPermission is specified,
then the
                aixm:ManoeuvringAreaUsage.type shall be "CONDITIONAL"
             -->
            <assert id="dnes-4.9.5-4"
test="not(aixm:availability/aixm:ManoeuvringAreaAvailability/aixm:usage
/aixm:ManoeuvringAreaUsage/aixm:priorPermission) or
(aixm:availability/aixm:ManoeuvringAreaAvailability/aixm:usage/aixm:Man
oeuvringAreaUsage/aixm:priorPermission and
aixm:availability/aixm:ManoeuvringAreaAvailability/aixm:usage/aixm:Mano
euvringAreaUsage[aixm:type='CONDITIONAL'])">
                If aixm:ManoeuvringAreaUsage.priorPermission is specified,
then the aixm:ManoeuvringAreaUsage.type shall be "CONDITIONAL"
                ID: <value-of select="$featureId" />
            </assert>

            <!--
                For the ManoeuvringAreaAvailability with
operationalStatus=CLOSED
                included in the TEMPDELTA, any eventual child
                aixm:ManoeuvringAreaUsage.type cannot have any other type
than
                "PERMIT" or "CONDITIONAL".
             -->
            <assert id="dnes-4.9.5-5" test="not($opStatus='CLOSED') or
($opStatus='CLOSED' and
contains('CONDITIONAL,PERMIT',aixm:availability/aixm:ManoeuvringAreaAva
ilability/aixm:usage/aixm:ManoeuvringAreaUsage/aixm:type))">
                For the ManoeuvringAreaAvailability with
operationalStatus=CLOSED included in the TEMPDELTA, any eventual child
aixm:ManoeuvringAreaUsage.type cannot have any other type than "PERMIT"
or "CONDITIONAL".
                ID: <value-of select="$featureId" />
            </assert>

            <!--
                If aixm:ManoeuvringAreaUsage.type is specified (not NIL),
then at least one aixm:selection shall be specified (not NIL)
            -->
            <assert id="dnes-4.9.5-6"
test="not(aixm:availability/aixm:ManoeuvringAreaAvailability/aixm:usage
/aixm:ManoeuvringAreaUsage/aixm:type) or
(aixm:availability/aixm:ManoeuvringAreaAvailability/aixm:usage/aixm:Man
oeuvringAreaUsage/aixm:type and
aixm:availability/aixm:ManoeuvringAreaAvailability/aixm:usage/aixm:Mano
euvringAreaUsage/aixm:selection)">
                If aixm:ManoeuvringAreaUsage.type is specified (not NIL),
then at least one aixm:selection shall be specified (not NIL)
                ID: <value-of select="$featureId" />
            </assert>

            <!--
```

```
            Only the following properties of AircraftCharacteristics
can be used in this
            scenario: type, engine, wingSpan and
wingSpanInterpretation, weight and
            weightInterpretation
         -->
         <assert id="dnes-4.9.5-7"
test="not(aixm:availability/aixm:ManoeuvringAreaAvailability/aixm:usage
/aixm:ManoeuvringAreaUsage/aixm:selection/descendant::aixm:AircraftChar
acteristic[not(aixm:type | aixm:engine | aixm:wingSpan |
aixm:wingSpanInterpretation | aixm:weight |
aixm:weightInterpretation)])">
            Only the following properties of AircraftCharacteristics
can be used in this scenario: type, engine, wingSpan and
wingSpanInterpretation, weight and weightInterpretation.
            Name: <value-of
select="name(aixm:availability/aixm:ManoeuvringAreaAvailability/aixm:us
age/aixm:ManoeuvringAreaUsage/aixm:selection/descendant::aixm:AircraftC
haracteristic/*)" />
            ID: <value-of select="$featureId" />
         </assert>

         <!--
            If more than one RunwayDirection has a TEMPDELTA TimeSlice
associated with the
            Event (the runway itself is closed), then these TEMPDELTA
shall have identical
            ManoeuvringAreaAvailability child elements. This rule
concerns only the
            ManoeuvringAreaAvailability elements that are not copied
from the BASELINE
            data - they do not have operationalStatus=NORMAL and do
not have an associated
            annotation with purpose=REMARK and the text="Baseline data
copy. Not included
            in the NOTAM text generation".
          -->
          <!-- untestable in schematron due to lack of support for
aggregation features in xpath -->
         <!--
         <let name="startTime"
value="aixm:timeInterval/aixm:Timesheet/aixm:startTime"/>
         <assert id="dnes-4.9.5-8"
test="count(//aixm:ManoeuvringAreaAvailability[../../../aixm:RunwayDire
ctionTimeSlice][../../descendant::event:theEvent/@xlink:href =
concat('#', $eventId)][../../../*/aixm:interpretation = 'TEMPDELTA'])
!=
count(//aixm:ManoeuvringAreaAvailability[../../../aixm:RunwayDirectionT
imeSlice][../../descendant::event:theEvent/@xlink:href = concat('#',
$eventId)][../../../*/aixm:interpretation =
'TEMPDELTA'][aixm:timeInterval/aixm:Timesheet/aixm:startTime=$startTime
])">
            Only the following properties of AircraftCharacteristics
can be used in this scenario: type, engine, wingSpan and
wingSpanInterpretation, weight and weightInterpretation.
```

```
            Count: <value-of
select="count(//aixm:ManoeuvringAreaAvailability[../../../aixm:RunwayDi
rectionTimeSlice][../../descendant::event:theEvent/@xlink:href =
'#event.runway_closure_example'][../../../*/aixm:interpretation =
'TEMPDELTA'])" />
            ID: <value-of select="$featureId" />
          </assert>
           -->
      </rule>
   </pattern>

</schema>
```