



International Civil Aviation Organization

**SEVENTEENTH MEETING OF THE METEOROLOGY  
SUB-GROUP (MET SG/17) OF APANPIRG**

Bangkok, Thailand, 13 – 16 May 2013

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**Agenda Item 8: OPMET (TAF, METAR, SPECI) Exchanges**

8.8) digital exchange of OPMET using XML/GML

**ICAO METEOROLOGICAL INFORMATION EXCHANGE MODEL (IWXXM)**

(Presented by United States)

**SUMMARY**

This paper presents an overview of the ICAO logical data model, known as the ICAO Meteorological Information Exchange Model (IWXXM), which has been under development by the World Meteorological Organization (WMO) Task Team on Aviation XML (TT-AvXML) and the ICAO Meteorological Aeronautical Requirements and Information Exchange Project Team (MARIE-PT), for the future exchange of METAR/SPECI, TAF, SIGMET and other meteorological information.

**1. Introduction**

1.1 Effective with Amendment 76 to ICAO Annex 3 – *Meteorological Service for International Air Navigation* (applicability Nov. 2013), exchange of METAR, SPECI, TAF and SIGMET may be done in digital form under a bilateral agreement between States in a position to do so. Amendment 76 also states that the digital form shall be formatted in accordance with a globally interoperable information exchange model and shall use extensible markup language (XML)/geography markup language (GML).

1.2 The ICAO Meteorological Aeronautical Requirements and Information Exchange Project Team (MARIE-PT) has also proposed that the exchange mentioned above be made a recommendation as part of Amendment 77 to Annex 3, and then a standard with Amendment 78 to Annex 3. This is consistent with the direction provided from the 12<sup>th</sup> Air Navigation Conference.

1.3 The MARIE-PT is also assessing what other Annex 3 products should be exchanged in digital form as part of Amendment 77 to Annex 3.

## 2. Discussion

2.1 XML has become broadly adopted worldwide, with a heavily utilized set of capabilities and related tools. This includes EXtensible Stylesheet Language (XSLT) for transformation, XML Schema and Schematron for specifying valid contents, XML Path Language (XPath) for specifying portions of documents, and others. XML is heavily utilized in aeronautical information systems (and web services in particular) due to its ubiquity and benefits.

2.2 The International Organization for Standardization (ISO) and the Open Geospatial Consortium (OGC) have developed mature mechanisms for the exchange of geo-spatial and temporal information in XML form with the ISO TC211 standards. Geospatial information is a commonality across the aviation system domains (e.g., weather, flight, and aeronautical information), allowing the geographic position and time of information to be easily integrated.

2.3 The ICAO Meteorological Information Exchange Model (IWXXM) is a data model built upon the ISO TC211 standards for Unified Modeling Language (UML) and XML. IWXXM also utilizes the World Meteorological Organization's (WMO) Modèle pour l'Échange des informations sur le Temps, le Climat et l'Eau (METCE).

2.4 METCE and IWXXM are composed of two parts: a logical model, represented in UML, and an XML schema generated from this logical model. The XML Schema formally specifies the expected report structure and contents, which enables existing libraries and tooling to be used to easily identify correctly formatted messages.

2.5 The WMO formed Task Team on Aviation XML (TT-AvXML) was tasked to identify the meteorological information that WMO must represent in the aviation XML standard in response to requirements from ICAO. The result was the development of METCE and IWXXM.

2.6 MARIE-PT currently expects a transition period where both the Traditional Alpha-numeric Codes (TAC) form and the matching XML/GML form will be distributed concurrently.

2.7 Technical guidance and documentation on the Digital Exchange of Aeronautical MET Information have been drafted by the MARIE-PT and will be published by ICAO as a manual (Doc 10003) in time for applicability of Amendment 76 to Annex 3. This technical guidance will include a visual and textual description of the model, examples, and information on tooling and technologies in the model.

2.8 More information on the newest version of METCE and IWXXM (1.0 Release Candidate 2) can be found at the following URL:  
<http://www.wmo.int/pages/prog/www/WIS/wiswiki/tiki-index.php?page=AvXML-1.0RC2>

2.9 An incomplete sample of a UML class diagram from the IWXXM 1.0 RC2 SIGMET logical model is shown below. This represents the high-level structure of SIGMET report information, along with relationships between SIGMET data structures.

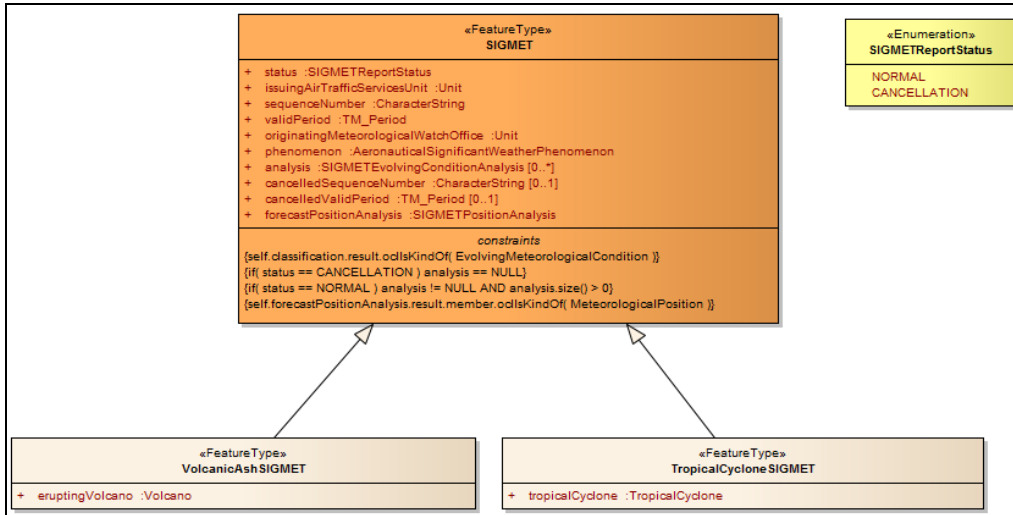


Figure 1 - SIGMET report UML

2.10 An example of the XML Schema used to validate contents is shown below. This XML Schema definition is generated from the UML model, and shows the documentation, structure, and constraints on METAR/SPECI wind shear information.

```
<element name="AerodromeWindShear" substitutionGroup="gml:AbstractObject" type="iwxxm:AerodromeWindShearType">
  <annotation>
    <documentation>An aggregation of wind shear conditions typically reported together at an aerodrome,
      including the set of affected runways.
    </documentation>
    <appinfo>
      <sch:pattern xmlns:sch="http://purl.oclc.org/dsdl/schematron" name="AerodromeWindShear1">
        <sch:rule context="//iwxxm:AerodromeWindShear">
          <sch:assert test="(if( @allRunwaysAffected = 'true' ) then empty(iwxxm:affectedRunway) else true())">
            AerodromeWindShear: When all runways are affected by wind shear, no specific runways
              should be reported
          </sch:assert>
        </sch:rule>
      </sch:pattern>
    </appinfo>
  </annotation>
</element>
<complexType name="AerodromeWindShearType">
  <sequence>
    <element maxOccurs="unbounded" minOccurs="0" name="affectedRunway" type="saf:RunwayPropertyType">
      <annotation>
        <documentation>The specific runways affected by wind shear at this aerodrome. No specific runways
          are reported when all runways are affected by wind shear
        </documentation>
      </annotation>
    </element>
  </sequence>
  <attribute name="allRunwaysAffected" type="boolean"/>
</complexType>
```

### 3. Action by the Meeting

3.1 The meeting is invited to note the information in this paper.

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