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**Agenda Item 6: Transition from the AERMETS Subgroup and its Task Forces to the MET Programme and its projects**

**SUPPORTING THE TRANSITION TOWARDS A DATA-CENTRIC AIR TRANSPORT SYSTEM**

(Presented by United States)

**SUMMARY**

This paper<sup>1</sup> provides a brief overview of the activities of FAA and EUROCONTROL in the area of Weather Information Exchange, underpinning data models and provides a resource for additional information and updates.

**1. Introduction**

1.1 In 2008, the U.S. Federal Aviation Administration (FAA) and the European Organisation for the Safety of Air Navigation (EUROCONTROL) started their conjoint activity to develop a suite of data models and guidance material in support of the transition towards a global data-centric aeronautical meteorological (MET) information environment. This is an extremely important component identified towards the implementation of net-centric oriented air traffic management (ATM).

1.2 The availability of shared, timely, high quality MET information will provide the foundation for the effective management of the (future) air traffic system as envisaged by the ICAO Global Air Traffic Management Operational Concept (Doc.9854) and is clearly recognised by emerging regional ATM developments.

1.3 The suite of data models developed by FAA and EUROCONTROL is organized in accordance with standing practices from ISO<sup>1</sup> and in accordance with recognised Architectural Frameworks such as NAF and DODAF<sup>2</sup>. It is characterized by three tiers, a high level conceptual (information) model (WXCM), a logical (exchange) data model (WXXM), and a physical (exchange) data model instantiated as an Extensible Markup Language (XML) and Geography Markup Language (GML) Schema (WXXS).

1.4 This paper provides some additional background on the WXCM, WXXM and WXXS, the design philosophy applied and links with the proposed roadmap components for the transition towards table driven data representation. Furthermore, the paper includes references to online resources for more

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<sup>1</sup> International Organization for Standardization (ISO)

<sup>2</sup> NATO Architectural Framework (NAF), US Department of Defense Architectural Framework (DoDAF)

detailed information on the models and ways to interactively engage with developers in the development and implementation phases.

## 2. Discussion

2.1 As recommended in the high level architectural frameworks, a three-tiered approach to data modelling has been employed. The three tiers include high-level information, or conceptual model, a logical data model, and a physical data model. As noted in the architectural framework guidance, the roles of and boundaries between these layers, particularly with respect to the information model and the logical data model, can be somewhat fuzzy. In the context of meteorological information exchange, the following distinctions are made:

2.2 *Conceptual model tier (WXCM)*. Provides a high-level view of the concepts and packages (e.g., ICAO Annex 3, ISO 19100), that make up the data model. In this data model, this layer is represented using a combination of plain text and UML package diagrams. This layer is implementation independent.

2.3 The WXCM is constructed in a series of layers; at the lowest level domain-neutral data types have been defined to encapsulate real world concepts, for example, **Speed**. These data types are not specific to either the meteorology or aviation domains. At the next two levels, domain-specific data types are defined for the general meteorological domain and the aviation weather domain, respectively. Data types in the lower layers are used as building blocks for data types in the higher layers. Data types in lower layers may also be refined in the upper layers as needed. For example, the data type **WindSpeed** in the aviation weather layer refines the generic lower-layer **Speed** data type with aviation weather-specific restrictions.

2.4 Figure 1 shows the structure of the WXCM with an aviation-specific layer shown at the top.

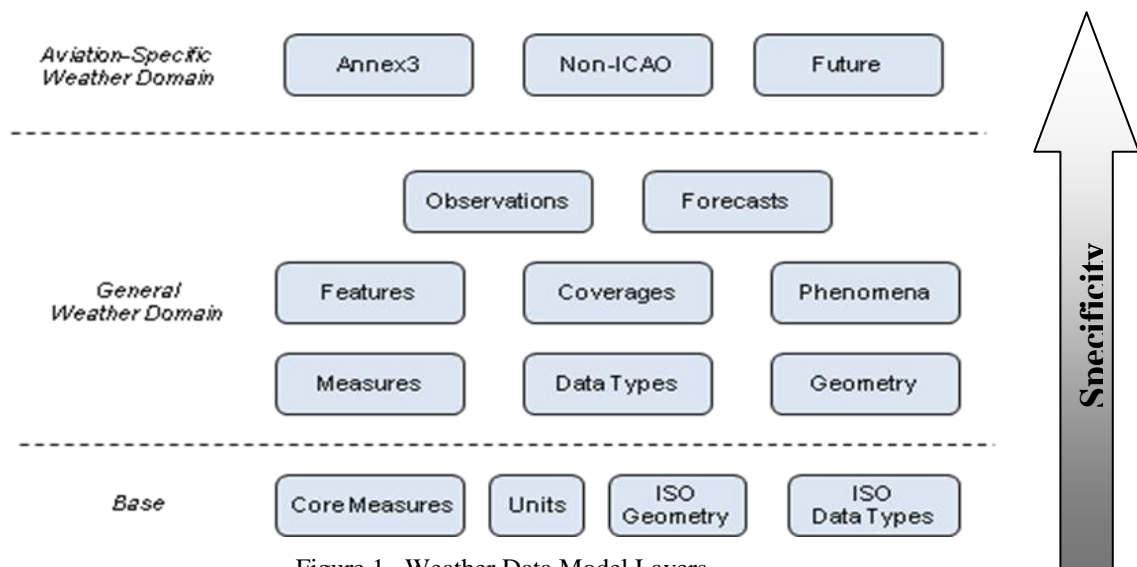


Figure 1. Weather Data Model Layers

2.5 *Logical data model tier (WXXM)*. Fully describes the exchange model associated with the information model, in an abstract form. In this data model, the logical model is represented using UML. This tier is implementation independent, capable of supporting multiple physical representations.

2.6 The WXXM is a logical data model that combines the concepts from the high-level WXXM packages into a coherent model that takes into account concerns related to data exchange. Similar to the concept of normalizing a database schema to reduce the duplication of information in associated objects, the logical weather model factors common information out of related objects where possible, with a goal of relatively efficient data transfers.

2.7 In essence, the logical data model and as such the WXXM is a representation of the lowest level of detail required to develop and implement the physical exchange of information. To ‘regulate’ this level of detail on information constructs is a common way of ensuring semantic interoperability. Reason for the proposed inclusion of a reference to a common logical (exchange) data model from an ICAO perspective.

2.8 *Physical data model tier (WXXS)*. Provides the mapping of the logical data model to a physical representation. This layer is represented using XML Schema, and is implementation-dependent. The geospatial aspects of the WXXS are implemented using Geography Mark-up Language (GML) version 3.2.1. By conforming to the GML Specification, it is intended that the WXXS datasets will be compatible with third-party GML-compliant applications, and hence enable aeronautical users to reap the benefits of open Geographic Information Systems (GIS) standards.

### 3. **Conclusion**

3.1 FAA and EUROCONTROL maintain a number of publicly available websites to share information on the data models for meteorological information and to actively engage with all the stakeholders. Furthermore, all the sites provide access to the latest versions of the models, examples and guidance documents.

3.2 The overarching general web site can be found at [www.wxxm.aero](http://www.wxxm.aero). This website will provide relevant information on the WXXM, WXXM and WXXS. Furthermore, this site will be the starting point for the WXXM forum that will be launched later in the year and provides links to the websites already available with a more technical data modelling focus.

3.3 The web sites with a more technical focus could be found at:

- “NNEWiki” site at: <https://wiki.ucar.edu/display/NNEWD/WXXM>
- “WXXM team’ at EUROCONTROL One Sky Online at: <https://extranet.eurocontrol.int>

### 4. **Recommendation**

4.1 The subgroup is invited to take note of the contents of this information paper in order to be attentive to the transition to Extensible Markup Language (XML) for the provision of MET information in the CAR/SAM Regions and familiarize with XML.