International Civil Aviation Organization
North American, Central American and Caribbean Office

WORKING PAPER

**Fourth North American, Central American and Caribbean Working Group Meeting
(NACC/WG/4)**
Ottawa, Canada, 24 to 28 March 2014

Agenda Item 3: **Follow-up on the NAM/CAR Regional Performance-Based Air Navigation Implementation Plan (NAM/CAR RPBANIP) Progress**
3.2 NAM/CAR Regional Performance-Based Air Navigation Implementation Plan: update, review and progress

AERONAUTICAL INFORMATION EXCHANGE MODEL (AIXM) DEVELOPMENT

(Presented by the Secretariat)

EXECUTIVE SUMMARY
This paper has been prepared in order to emphasise the importance of analysis of guidance material on digital data exchange based on AIXM. ICAO State Letter for the adoption of Amendment 36 to Annex 15 proposed the modification of the existing ICAO Recommended Practices for the "Use of automation" in AIS. The objective is to also enable digital data exchange based on an ICAO reference model.
In order to support the States to comply with this standard, it is proposed to review all Guidance Material on an aeronautical conceptual and data exchange model, based on the AIXM version 5.1, and to achieve this, States need to implement strict Quality Management System (QMS) principles, taking into account that all available information is validated and safe to provide confidence that the information received comes from an authorized proper high quality source.

Action:	Action required in Paragraph 4
Strategic Objectives:	• Safety • Air Navigation Capacity and Efficiency • Environmental Protection
References:	• Annex 15, ICAO • Doc 8126 Aeronautical Information Services, ICAO • AIS-AIM/SG Summary of Discussions • ICAO Roadmap for the transition from AIS to AIM • RTCA SC-193/EUROCAE WG-44 GML

1.   Introduction

1.1   The Aeronautical Information Exchange Model (AIXM) and the related Aeronautical Information Conceptual Model (AICM) contain hundreds of entities, data types, and relationships used to represent aeronautical data. The models are primarily based on ICAO requirements for international aeronautical data exchange (Annex 15 to the ICAO Convention) and on industry standards such as ARINC 424. AICM and AIXM were originally developed by EUROCONTROL and United States to aid in standardizing data exchange and aeronautical products within the European States. AICM and AIXM may be divided into six basic concepts—Airspace, Services, Fixes, Routes, Aerodromes and Procedures, and in the near future Digital NOTAM. The major entities and relationships within these data concept areas are in the AIXM's geographical model for representing the locations and extents of the aeronautical data entities.

1.2   According with Annex 15 (SARPs) on Chapter 2, Paragraph 2.3   "Exchange of aeronautical data and aeronautical information", it is mentioned that "…Each State shall designate the office to which all elements of the Integrated Aeronautical Information Package originated by other States shall be addressed. Such an office shall be qualified to deal with requests for aeronautical data and aeronautical information originated by other States." A common data format (AIXM) is required to ensure interoperability. In addition to using a common standard format, it is important to harmonise the data content to ensure that the actual meaning of the data can be clearly understood in an unambiguous way.

2.   Discussion

2.1   The second phase of the ICAO Roadmap for the Transition from AIS to AIM, includes the production of all Integrated Aeronautical Information Package (IAIP) products (AIP, AMDt, AIC, NOTAM, SUPPLEMENTS, etc.) as output of aeronautical information relational databases. In phase three, this data shall also become available in a format suitable for direct digital exchange.

2.2   Further, the AIM TF group discussed Logical Model versus its technical representation. Information as modelled for System wide information management (SWIM), which is tailored for AIM, may not be usable for other areas. (See Figure 1) Compatibility layers need to hide technical details from operators and make the entire environment appear seamless. The modelling has to take into account that different representations of the data will be required. It was concluded that the logical data content needs to be defined.

2.3   The Aeronautical Information Exchange Model (AIXM 5.1) includes:

　　　　　　a)   a Conceptual Model that describes the data managed by AIS using the Unified Modelling Language (UML), which is the most common modelling language in use; and

　　　　　　b)   Data Exchange Format based on the Extensible Markup Language (XML) and, more precisely, on the Geography Markup Language (GML), which is an ISO Standard (ISO 19136) for the encoding of geographical information.
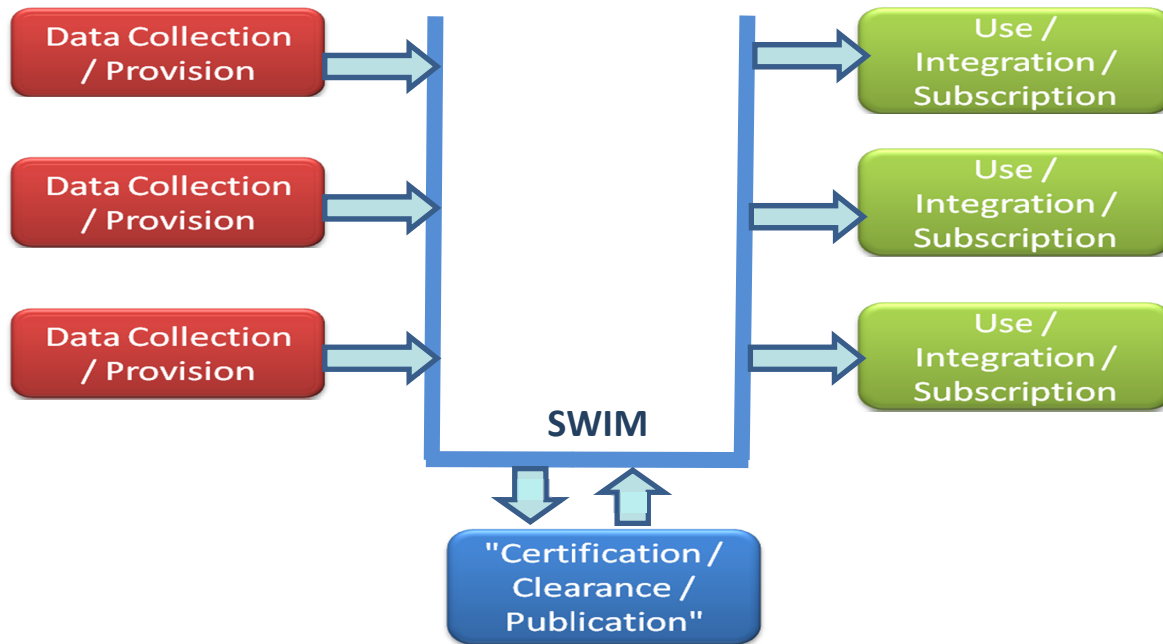
Figure 1

2.4   The Aeronautical Information Conceptual Model (AICM) describes entities, attributes and relationships in six basic aeronautical concept areas:

Airspace	Entities for representing three dimensional regions such as air traffic control sectors, international flight information regions (FIRs), Military Operating Areas (MOAs) and other airspace.
Fixes	Locations within the airspace system which may be defined geographically or in relation to ground based navigational equipment such as a VHF Omni-directional Radio Range beacon (VOR). Fixes are used to describe air traffic routes, and approach and departure procedures.
Routes	Represents a path through the en-route airspace using a set of significant points. Within the States this includes Lower and Upper (e. Juliet and Victor) routes. The concept also includes a model for routing restrictions, such as those contained in letters of agreements between control centres.
Aerodromes	Represents a defined area used for take-off, landing and surface movement operations of aircraft and helicopters. This conceptual area includes runways and equipment used for departure and arrival operations (such as landing lights) as well as information about ground services and facilities.
Procedures	Terminal routes such as instrument approach procedures, standard instrument departure procedures and standard terminal arrival routes. The procedures data concept area is based on ICAO Doc 8168 Vol. II and the ARINC 424 specification and it includes entities for defining flight legs, turns, final approaches and other entities for directing the flight path into and out of terminal areas.

Services	Generic entities used to represent organizations, units and services within the airspace system. This data concept area is used, for instance, to represent weather briefing services that may be located within an en route control centre.

2.5   In this regard, the following draft conclusion is proposed:

**DRAFT
CONCLUSION NACC/WG/4/XX   REPORTING ON THE PROGRESS ACHIEVED IN THE IMPLEMENTATION OF THE AERONAUTICAL INFORMATION EXCHANGE MODEL (AIXM)**

That the States and International Organizations:

a)   adopt the AIXM 5.1 information exchange model;

b)   report to the ICAO NACC Regional Office on the progress achieved in the application of the conceptual model and aeronautical information exchange by 31 December 2014.

3.   Conclusion

3.1   The main objective of the eAIP project (electronic AIP) is to increment and standardize the use of AIM automation promoting that electronic versions replace the current elements which are based on paper for Integrated Aeronautical Information Package (IAIP, Annex 15). To achieve this, a technical specifications harmonized set should be adopted to support the electronic production, publication and consultation of the IAIP.

3.2   A limited set of airport physical and operational characteristics are included in the AIXM that has been used as the Annex 15 IAIP template (see also Doc 8126 for the AIP specimen), for this purpose. It is necessary to develop AIXM extensions based on GML schemes to allow applications intended for the information in aerodrome electronic charts, according with the document RTCA SC-193/EUROCAE WG-44 "User Requirements for Aerodrome Mapping Information", which is focused on the operational use of electronic cartography used in on board devices.

4.   Suggested Action

4.1   The Meeting is invited to:

a)   take note of the progress to implement the AIXM;

b)   to revise and approve the draft conclusion in paragraph 2.5 and any action that the Meeting consider to be convenient.

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