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

INFORMATION PAPER

ANI/WG/4 — IP/06
19/07/18

Fourth NAM/CAR Air Navigation Implementation Working Group Meeting (ANI/WG/4)
Miami, United States, 21 – 24 August 2018

Agenda Item 4: **Follow-up, Performance Evaluation and Monitoring of the CAR Regional Performance Based Air Navigation Implementation Plan**
4.1 Progress Reports of the Task Forces of the ANI WG

STATUS OF THE FAA'S TRANSITION FROM AIS TO AIM

(Presented by the United States)

EXECUTIVE SUMMARY	
This paper presents the status of the U.S. Federal Aviation Administration's (FAA) transition from AIS to AIM in alignment with ICAO's Roadmap.	
Strategic Objectives:	• Safety • Air Navigation Capacity and Efficiency
References:	• ICAO Roadmap for the Transition from AIS to AIM • ICAO Annex 4 – Aeronautical Charts • ICAO Annex 11 – Air Traffic Services • ICAO Annex 15 – Aeronautical Information Services • ICAO Doc. 9750 – Global Air Navigation Plan (GANP) • FAA Advisory Circular (AC) 150/5300-16 – General Guidance and Specifications for Aeronautical Surveys: Establishment of Geodetic Control and Submission to the National Geodetic Survey (NGS) • FAA AC 150/5300-17 – Standards for Using Remote Sensing Technologies in Airport Surveys • FAA AC 150/5300-18 – General Guidance and Specification for Submission of Aeronautical Surveys to NGS: Field Data Collection and Geographic Information System (GIS) Standards

1. Introduction

1.1 The size and complexity of the United States' national airspace system creates a difficult challenge for the FAA to transition from its traditional analogue, product-centric Aeronautical Information Services (AIS) to a digital, services-centric Aeronautical Information Management (AIM) environment. The sheer numbers of aeronautical data to manage is staggering more than 19,500 public and private aerodromes. More than 19,000 procedure charts with more than 35,000 lines of minima, more than 1,200 airways and nearly 5,000 minimums. In 2017 alone, we conducted Instrument Flight Procedure (IFP) impact analyses for more than 140,000 obstacles and issued more than 600,000 international NOTAMs. In an environment where requirements continue to grow and resources do not, the FAA must implement AIM principles to effectively and efficiently manage its growing data resources and information assets.

2. Background

2.1 The FAA currently employs approximately 400 Aeronautical Information Specialists who perform most of our charting, procedure development, obstacle evaluation and Aeronautical Information (AI) database management functions. However, there are 11 more in the US NOTAM Office, 40 responsible for the publication of the Aeronautical Information Publication (AIP), and countless other, non-AI specialists, who develop related policies and directly support the systems, networks and interfaces required to make the FAA's transition from AIS to AIM a reality. These specialists are not located in a single, consolidated location, but spread across the continent in Maryland, New York, Georgia, Washington, D.C., Illinois, Missouri, Texas, Oklahoma, California, Washington State and Alaska. Regardless of these organizational realities, the FAA's obstacle evaluation, NOTAM, AIP, Aeronautical Information database management, procedure development and charting groups are all moving toward meeting the goals identified in the ICAO Roadmap for the Transition from AIS to AIM. Updates on the FAA's progress toward each of the goals in The Roadmap are presented in the following discussion.

3. Discussion

3.1 *Phase 1 – Consolidation*

3.1.1 Monitoring of Annex Differences: The FAA's air traffic organization works with the FAA's AIM organizations on a continuous basis to identify and remedy, where possible, our differences to ICAO Annexes 4, 11 and 15.

3.1.2 AIRAC Adherence Monitoring: Although many of the FAA's AIM products are on different production schedules, they all adhere to the internationally recognized, Aeronautical Information Regulation and Control (AIRAC) synchronization process.

3.1.3 Quality Management Measures: Standard Operating Procedures (SOPs) for all of the FAA's charting, procedure development and AI database entry and maintenance personnel are now ISO 9001-2015 certified.

3.1.4 WGS-84 Implementation: The goal of expressing coordinates in the WGS-84 reference system is not being pursued by the FAA's AIM groups. A 1990 U.S. law mandated the FAA convert all positional data into the 1983 North American Datum (NAD 83). The maximum difference between the NAD 83 and WGS-84 reference systems is 2 meters horizontally and vertically. Although some products, such as the FAA's Digital Obstacle File (DOF), use the WGS-84 horizontal datum, the FAA will not likely adopt a new datum in its entirety until after the US National Geodetic Survey completes its collection for a new geoid, which will be published sometime in or after 2022. The resulting datum will be GPS-based and therefore, should agree closely with the WGS-84 datum

3.2 *Phase 2 – Going Digital*

3.2.1 Electronic Aeronautical Information Publication (AIP): The US AIP is available as a free .pdf file or as an HTML version at the following location:

https://www.faa.gov/air_traffic/publications/atpubs/aip_html/

You can also access both formats through the FAA's main Air Traffic Publications page:

https://www.faa.gov/air_traffic/publications

3.2.2 Aerodrome Mapping: The current U.S. airport survey standard(s) allows for the collection of digital aerodrome data suitable for use in airport mapping databases, however, not all U.S. aerodromes used by international civil aviation have been surveyed to this standard.

3.2.3 Obstacles: The FAA makes a number of obstacle datasets available for download, free of charge. These are not currently in the Aeronautical Information exchange Model (AIXM) format. These datasets include the:

- Daily Digital Obstacle File (DDOF): The DDOF is available as a zipped Data Attribute Table (DAT) or Comma Separated Value (CSV) file and provides the latest obstacle information in the FAA's database. It is updated daily.

- Daily Change File: This DAT file provides all DDOF changes.

- Digital Obstacle File (DOF): This DAT file contains all known man-made obstructions to air navigation or navigational facilities within the U.S. and its territories which affect domestic aeronautical charting products. Such facilities include air navigation aids, communication equipment, airports, Federal airways, instrument approach or departure procedures, and approved off-airway routes. This file also contains known obstacles within the Caribbean, Mexico, Canada and the Pacific. It is prepared and posted to an FAA website every 56 days and it includes the latitude and longitude, structure type, height above ground, height above sea level, lighting, marking, accuracy code, and other associated information.

- Weekly Construction Notices: This DAT file include obstacles added, modified, or dismantled during the prior week.

- Obstruction Evaluation/Airport Airspace Analysis (OE/AAA) Aeronautical Studies: All aeronautical studies processed by the FAA are publicly available at https://oeaaa.faa.gov and all aeronautical study records are freely available using various search features on this site.

3.2.4 Terrain: The majority of eTOD related terrain collection is the responsibility of the United States Geologic Survey (USGS) and is available for download from their website, free of charge.

3.2.5 Data Quality Monitoring: See 3.2.6

3.2.6 Data Integrity Monitoring: The FAA's largest AIM group does not currently have a specific quality manual but relies on a layered approach to data integrity and quality monitoring. The group monitors external data sources for quality and integrity through its data submission process and vetted sources. The databases that store the AIM data also perform some data integrity checks. A complete list of these is currently not available; however, an example would be preventing an airport deactivation when certain conditions exist. There is also a recently developed set of data quality checks and supporting Standard Operating Procedures (SOP's).

The AIM data submission process has embedded restrictions on who can submit certain forms/data sources. Verification of government submitters occurs before giving them access to the AIM data submission portal. Similar measures exist for non-government submitters.

Due to their experience, the FAA's AIM group still uses aeronautical information specialists as the final protection to data integrity. These specialists still review all AIM data submissions before entering them into the AIM databases. Each chart and digital data product also undergoes additional quality control checks before becoming available to the public.

3.2.7 Aeronautical Information Conceptual Model: The FAA uses its Enterprise Logical Data Models in conjunction with the Single European Sky ATM Research (SESAR) Aeronautical Information Reference Model (AIRM) and data exchanges of AIXM, Weather Information exchange Model (WIXM) and Flight Information exchange Model (FIXM) to create the ICAO AIRM (ATM Information Reference Model). Current versions of the FAA's Enterprise Logical Data Model and the SESAR AIRM guide the development of the FAA's aeronautical information available in an AIXM format. The process for providing AIRM compliant AIXM data includes three phases. The first works by mapping AIXM features and objects with SESAR AIRM entities and objects. The second, maps the properties of the AIXM features with SESAR AIRM properties and the third, drills down to the property types.

3.2.8 Unique Identifiers: The FAA is working to implement Universally Unique Identifiers (UUID's) for aeronautical data features. The FAA's new AIM authoritative sources system contains UUID's; there are however, still some older systems (NASR) that do not contain a field for UUID's. We are aware this is an interoperability issue.

3.2.9 Integrated Aeronautical Information Database: Currently the FAA maintains multiple databases for Aeronautical Information (AI) however; the agency has successfully deployed a consolidated database for its obstacle information and developed a related AIXM 5.1 web service. Consolidated airport and navaid databases, and their associated AIXM 5.1 web services should be complete this year. Once these projects are complete, external distribution of all three types of AI (obstacles, airports and navaids) will occur via a single access point, known as the Aeronautical Common Service (ACS). The ACS will have four main functional capabilities: AI Integration, AI Data Analytics, AI Subscription Services and Spatial Information Mapping. It will ingest aeronautical data from the new, consolidated databases and then transform, validate (for integrated products), verify, store, and distribute the resultant AI to users and systems over SWIM through AIM enterprise web services such as our Web Feature Services (WFS) and Web Map Services (WMS). The ACS should be operational by 2019.

3.3 *Phase 3 – Information Management*

3.3.1 Training: As we transition to data-driven processes and products, training may be required to support these initiatives. Future training opportunities will include those for software applications and database management. Current opportunities, available to FAA employees and our international partners include:

- Introduction to Flight Procedures
- Principles of Performance Based Navigation (PBN) Approaches
- Departure Procedures
- Basic PANS-OPS (& Refresher)
- PBN PANS-OPS
- TARGETS (Terminal Area Route Generations, Evaluations and Traffic Simulations)
- Overview of Flight Procedure Development
- Introduction to Aeronautical Charts

3.3.2 Agreements with Data Originators: The FAA has an Interagency Agreement with the United States Government's National Oceanic and Atmospheric Administration (NOAA) for airport survey data to provide products and services necessary to identify and locate airport safety critical data to protect aircraft from obstacles affecting their movement both on the ground and in the air. The FAA relies on the expertise of the NOAA, National Ocean Service (NOS) and National Geodetic Survey (NGS), Aeronautical Survey Program (ASP) to verify and validate imagery and surveys data submitted to FAA survey programs in addition to performing aeronautical information surveys in accordance with FAA Advisory Circulars (AC) 150/5300-16, 150/5300-17, and 150/5300-18

3.3.3 Electronic Aeronautical Charts: FAA aeronautical charts are currently available as free digital downloads on the FAA's Aeronautical Information Services website. Most charts are available in both georeferenced and non-georeferenced formats. The FAA is in the process of transitioning to data-driven production processes for aeronautical charts and publications, which will allow the accompanying product data be published in geospatial formats whenever possible.

The FAA has no current plans to publish digital charts for direct ingestion into electronic flight management systems. The current business model is to publish digital aeronautical charts along with their underlying product data in order to allow industry to create innovative applications and electronic flight management systems using digital FAA data, charts, and publications

The current schedule for the implementation of data-driven production and release of accompanying product data is:

- FAA IFR Enroute High and Low Charts – Complete (Jan. 2017)
- FAA VFR Aeronautical Charts – Digital datasets (by feature class) available starting Oct. 2018
- FAA Terminal Procedures Publication – Digital procedure data available starting June 2019
- FAA Airport Sketches and Diagrams – Digital airport products and data available starting June 2019

3.3.4 Aeronautical Information Briefing: The FAA's "NOTAM Search" is a public website that contains all active and archived NOTAMs for the past three years. Within NOTAM Search, a user can search for NOTAMs that pertain to a specific location, or to a route of flight, including those for divert airports. The user can then apply filters and sort these NOTAMs so that the most pertinent are displayed at the top of their list. In the future, NOTAM Search will be updated to provide a graphical depiction of NOTAMs. This update will occur gradually with Traffic Flow Restriction (TFR) NOTAMs as the first NOTAM type that will be graphically displayed. In addition, the Federal NOTAM System (FNS) does have a map on the NOTAM Search website, which allows a user to visualize the location of a NOTAM. Most of the FAA's other pre-flight briefing material, such as Chart Supplements, Construction Diagrams and the Notice to Airman Publication (NTAP) are also freely accessible in searchable, user friendly formats from the NOTAM Search website.

3.3.5 Communication Networks: The FAA uses a satellite-based network (MEVA III) to support air traffic services in the Caribbean. This system supports Internet Protocol (IP) based data flows over frame relay. Currently, most of our ground-to-ground services over MEVA are 64Kbps, but bandwidth services up to 2Mbps, are available. There has been no international determination made as to whether or not AIM data will be required to use dedicated network services like the Aeronautical Telecommunications Network, an open network such as the internet, or even a combination of the two, depending on the specific product. Until those decisions are determined, the FAA will not know whether the current international services will be capable of supporting future AIM data flows. Some clarity may come to this with the introduction of the "Network Connectivity" thread into ICAO's Global Air Navigation Plan (GANP) and the associated Aviation System Block Upgrades (ASBUs) in 2018.

3.3.6 Interoperability with Meteorological Products: The FAA and NOAA are working together to modernize seven Annex 3 legacy text products. These include METAR, SPECI, TAF, SIGMET, AIRMET, Volcanic Ash Advisory, and Tropical Cyclone Advisories. This is being accomplished in accordance with the standardized ICAO Meteorological Exchange Model (IWXXM) XML schemas. Many of the forecast and advisory products are being created in IWXXM at the point of production, and are disseminating messages in both IWXXM and the legacy Traditional Alphanumeric Code (TAC). METARs and SPECIs will require translation to IWXXM from the TAC for some time. There are over 1,800 automated observing systems within the U.S. national airspace system, many of which are privately owned. It will take a number of years to update the software in these systems to produce output natively in IWXXM formats. NOAA and the FAA are working together to do the translation services, before international distribution of these messages. These Annex 3 products will be available in both the TAC and IWXXM formats until the TAC is eliminated by ICAO.

3.3.7 Digital NOTAM: The legacy (analogue) United States NOTAM system (USNS) is migrating to the digital Federal NOTAM System (FNS), with FNS now generating around 80% of NOTAMs digitally. The new system has SWIM connectivity, resulting in improvements to efficiency and safety for airspace users. FNS allows for the automatic transformation from the US NOTAM format to ICAO and plain language formats. It uses business rules for validation and allows for information exchange by using AIXM 5.1 format.

3.3.8 Aeronautical Data Exchange: The FAA is committed to providing the public with free aeronautical data in a wide variety of open data formats best suited for pilots, developers and other stakeholders. The FAA maintains an Open Data website known as the Aeronautical Data Delivery Service (ADDS) where users can filter and download aeronautical data in the following formats: Data Attribute Table (DAT), Comma-Separated Value (CSV), Keyhole Markup language Zipped (KMZ), Shapefiles (SHP), ARINC 424 and Text (TXT) formats. To browse the FAA's aeronautical data website and for a link to the ADDS, please visit: https://www.faa.gov/got_data/aero_data/

Additionally, beginning in 2019, external users will be able to access airport, navaid and obstacle data in AIXM 5.1 format through SWIM by subscribing to the FAA's Aeronautical Common Service (ACS).

4. Conclusion

4.1 The FAA generates, maintains and distributes an immense amount or aeronautical data and information on an annual basis. This accomplishment results from the hard work and dedication of all who directly and indirectly support the networks, systems, interfaces and exchange mechanisms of the regional aviation system and those who directly process and disseminate the NOTAMs, publication and products that are the foundation of the US national airspace system. Collectively, this group of professionals is transitioning to a data and system centric environment as quickly as resources allow.

— END —