International Civil Aviation Organization

**Tenth Meeting of the MIDANPIRG AIM Sub-Group
(AIM SG/10)**

(Cairo, Egypt, 28 – 29 February 2024)

Agenda Item 4: **AIM Planning and Implementation in the MID Region**

DATA-DRIVEN IAP CHARTS

(Presented by United Arab Emirates)

SUMMARY

The objective of this working paper is to present the progress made by the United Arab Emirates in implementing Data Driven IAP Charting, encountered challenges, and adopted solutions. The working paper also proposes recommendations to support harmonization in ICAO MID Region.

Action by the meeting is at paragraph 3.

REFERENCE
- ICAO ANNEX 15 - AERONAUTICAL INFORMATION SERVICES
- ICAO ANNEX 4 - AERONAUTICAL CHARTS
- ICAO DOC 8697 - AERONAUTICAL CHART MANUAL
- ICAO 9750 - GLOBAL AIR NAVIGATION PLAN
- ICAO - ROADMAP FOR THE TRANSITION FROM AIS TO AIM
- ICAO 9854 - GLOBAL AIR TRAFFIC MANAGEMENT OPERATIONAL CONCEPT
- ICAO MIDANPIRG - DOC 008 - MIDANPIRG - GUIDANCE FOR AIM PLANNING AND IMPLEMENTATION IN THE MID REGION
- EUROCONTROL AERONAUTICAL INFORMATION EXCHANGE MODEL (AIXM)

1.   INTRODUCTION

1.1   ICAO endorsed Global ATM Operational Concept (Doc 9854) and recognized that in the global air traffic management (ATM) system environment envisioned by the operational concept, aeronautical information service (AIS) would become one of the most valuable and important enabling service. As the global ATM system foreseen in the operational concept was based on a collaborative decision-making environment, the timely availability of high-quality and reliable electronic aeronautical, meteorological, airspace, and flow management information would be necessary.

1.2   ICAO published in 2009 the "Roadmap for the transition from AIS to AIM". It identifies the major milestones recommended for a uniform evolution across all regions of the world and specific steps that need to be achieved.

1.3   ICAO introduced the Aviation System Block Upgrades (ASBU) methodology in the fourth edition of the Doc 9750 (Global Air Navigation Plan), endorsed by the ICAO Assembly in 2013,

as a systemic manner to achieve a harmonized implementation of the air navigation services. It designates a set of improvements that can be implemented globally from a defined point in time to enhance the performance of the ATM system.

1.4   The GANP represents a rolling, 15-year strategic methodology, which leverages existing technologies and anticipates future developments based on State/industry agreed operational objectives. The Block Upgrades are organized in six-year time increments starting in 2013 and continuing through 2031 and beyond.

1.5   MID Doc 008 "Guidance for AIM Planning and Implementation in the MID Region" has been developed to harmonize the transition from AIS to AIM in the MID Region and to address Global and Regional issues related to planning and implementation of Aeronautical Information Management. For planning, MID Doc 008 mentions 2031+ as the timeframe for states to implement Electronic Aeronautical Charts.

2.   DISCUSSION

2.1   In support of ICAO ASBU and MID Region Implementation Plan, UAE has prepared a Database Driven Charting Implementation Plan (Intermediate and Long Term) to migrate legacy charts progressively. UAE has already completed the migration of the En-route Charts and has started migrating SID and STAR charts into Database Driven Charts. In parallel, UAE carried out the required feasibility study for migrating RNP Approach Charts.

2.2   To support interoperability due to implementation of various Aeronautical Information Exchange Model (AIXM) Database systems and business rules by stakeholders a Coding Standardization Document is also been prepared.

2.3   Feasibility study of RNP Approach Charts exposed similar challenges faced in producing and publishing RNAV SID and STAR chart which are discussed in paper "Data Driven Charting" presented in MIDANPIRG/20 & RASG-MID/10 -WP/47. Current paper discussed the unique challenges to production of RNP Approach Charts in subsequent paragraphs.

2.4   Legacy chart output is based on the procedure design logic calculated by Procedure Design software applications. Procedure Design application were able to exploit the high level requirements provided in Annex 4. However unifying/mapping the procedure design logic; legacy charts and Annex 4 into Aeronautical Information Exchange Model (AIXM) which is tightly associated with Relational Database logic is challenging. Most of the challenges are associated with Final Approach Segment which is the most critical phase of the flight operations. Below are some challenges which requires harmonization/Standardization:

- One of the attributes of Aeronautical Information Exchange Model (AIXM) is Coding Rules with various versions of ARINC 424. Knowing the rules of coding are essential for Flight Management System (FMS) integrators to apply intend of the procedure designer. However such data is filtered out in the data chain. Hence a standard guidance is needed to unify the coding regionally and to be propagated to end users.
- Procedures are designed on path and terminator concept and Database Driven charting systems are primarily designed for GML (Geographic Markup Language) based trajectory. RNP approaches with RF (Radius to Fix) faces challenged in depiction of curves on charting application due tolerances implemented to close gap between the curved trajectory. To overcome this charting applications prefer 3 point Arc. Adoption of such solution creates critical safety risks as the AIXM file is intended to be shared with FMS integrator. FMS integrators encodes the data as Path and Terminator. Hence a standard guidance is needed to

unify the coding regionally and to be propagated to end users.

- Legacy charts depict the intent of procedure designer. These legacy charts depict not only final approach profile but profile elements starting from Initial Approach. The profile view becomes complex for Database Driven Charting for approached with multiple Initial approaches (Ex. T - Bar Initial Approach Segments).

  Similar to the above example Approach Charts contain procedure-specific notes that convey the procedure designers intent accordingly to local conditions example minimum and maximum temperate limits for operating the procedures. Such notes are partially logical as per AIXM and partially textual only.

  Another example is also depiction of Communication Frequency for Approach Procedures where frequencies such as GROUND Frequency is depicted on RNP Approach Charts due to flexibility provided by Annex 4. Due to relational database logic Ground Frequency cannot directly linked to Approach Procedure.

  Hence a standard guidance is needed to unify the Chart depiction and coding regionally to be propagated to end users.

2.5   RNP Approach chart depict the missed approach profile by depicting the final decision altitude/height (LNAV/VNAV; LNAV Only) to make approach decision. But charting application are GML (Geographic Markup Language) based which need a fix to start the missed approach. Due to relational database logic missed approach is encoded to start from missed approach point which generally is associated with THR Height for RNP Approach instead of final decision altitude/height. Hence there is no other way than false encoding to convey the procedure design logic using the AIXM Model. Hence a standard guidance is needed unify AIXM coding and chart depiction to propagate unified information to end users.

2.6   Database Driven Charting System and Relational Databases AIXM logic requires certain data elements (e.g., climb gradient, mandatory RVR, visibility) for chart production. But such data requirements are that are not specified in Annex 4 or Doc 8697 Chart Specimen. Hence a standard guidance is needed to unify regionally AIXM coding and Chart depiction to propagate unified information to end users.

3.   ACTION BY THE MEETING

3.1   The meeting is invited to:

  a) note the information provided in this working paper;

  b) task the DDI Ad-hoc WG to address the possible challenges and to propose a unified solutions for the region; and

  c) submit the WP to the MIDANPIRG21 meeting for guidance and direction.

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