International Civil Aviation Organization

MIDANPIRG/18 and RASG-MID/8 Virtual Meeting

(15-22 February 2021)

Agenda Item 5:   **MIDANPIRG Work Programme**
                              5.2.6 Specific Air Navigation issues: CNS

REALIZATION OF FF-ICE CONCEPT – 4D TRAJECTORY MODEL

(Presented by the United Arab Emirates)

SUMMARY

This paper presents the ongoing implementation initiatives of the 4D Trajectory model by United Arab Emirates in the realization of FF-ICE concept as entailed in the ASBU blocks. This initiative targets B3–FICE - Improved Operational Performance through the introduction of Full FF-ICE Data for all the relevant flights systematically shared between the air and ground systems using SWIM infrastructure in support of collaborative ATM and Trajectory Based Operations.

Action by the meeting is at paragraph 3

REFERENCES

– ICAO Doc 9750 - Global Air Navigation Plan for CNS/ATM Systems
– ICAO Doc 9854 - Global Air Traffic Management Operational Concept
– ICAO Doc 9965 - Manual on Flight and Flow (FF-ICE)

1.   **INTRODUCTION**

1.1   The role of FF-ICE: as a product of the ICAO Global ATM Operational Concept, FF-ICE defines information requirements for flight planning, flow management and trajectory management and aims to be a cornerstone of the performance-based air navigation system. Flight information and associated trajectories are principal mechanisms by which ATM service delivery will meet operational requirements. (ASBU-Appendix B)

1.2   While realizing the need and urgency of sharing an effective, up-to-date and accurate Flight and Flow information during all the phases of flight, the UAE seized the opportunity to design and develop a full FF-ICE 4D Trajectory model which is envisioned to fulfil the ASBU B3-FICE requirements.

1.3   The design and development of FF-ICE 4D trajectory model was carried in accordance with the following objectives:

1.3.1   An enabler of accurate and efficient Information exchange with Aerodromes and AUs to ensure the effective regional SWIM and CDM deployment

1.3.2   An enabler of accurate and timely information exchange pertaining to ATFM constraints and measures to ensure the effective ATFM implementation

1.3.3   Publishes the most up-to-date flight and strategic tactical flow management data to all the regional and international stakeholders to facilitate the Trajectory Based Operations (TBO).

1.3.4   To ensure the completeness and accuracy of information as per the regional requirements

2. DISCUSSION

2.1   Using the Flight Information Exchange Model (FIXM) core version 4.2, the UAE has created essential FIXM extensions to facilitate a 4D trajectory model stipulating each phase of the flight starting from filing, negotiating, agreed, execution and completion incorporating key features such as ATFM measures, ACDM information and tactical flight progress messages.

2.2   For trajectory management, GCAA makes use of a set of FF-ICE trajectories notably;

    2.2.1 Filed   - planning phase   - Pre-tactical

    2.2.2 Agreed   - planned but not executed yet - Pre-tactical

    2.2.3 Executed - Actual executed trajectory. - Tactical

2.3   To ensure the provision of an accurate flight and flow information, the flight phases are infused with 4D Trajectories, thereby enabling the demonstration of exact status of the flight in both tactical and pre-tactical phase.

2.4   According to the GCAA's 4D trajectory model, the flight in a pre-tactical phase is represented using a single trajectory, either "Filed", "Negotiating" or "Agreed" depending on the life cycle of the flight and the flight in a tactical phase is represented using two trajectories i.e. "Agreed" and "Executed".

2.5   In tactical phase, the trajectory points that have been flown are moved to "Executed" trajectory while the not flown points are kept in "Agreed" trajectory.

2.6   Such representation of tactical phase using two trajectories enables the depiction of actual flight path under "Executed" trajectory where the last route point shows the actual current position of the flight, whereas the route points in "Agreed" trajectory formulates the planned flight path trajectory which is yet to be flown, however being fully updated as per the current position of the aircraft.

2.7   The flight representation created using this model is capable of capturing flow properties such as time (scheduled, estimated, and actual) over route points in both pre-tactical and tactical phases.

2.8   For instance, during the tactical phase, when a certain route point is moved from "Agreed" to "Executed" trajectory, the time associated with it is also updated to reflect the Actual Time Over (ATO) that point for the flight in question, thereby changing the properties of the absolute time from "estimated" to "actual". Similarly, the Estimated Time Overs (ETOs) for the downstream, yet to be flown, route points are recalculated as per the current ATO, thus providing the best possible trajectory prediction to the downstream ANSPs for their capacity planning and Trajectory Based Operations (TBOs).

2.9   This model, having a comprehensive design for the enriched Flight & Flow Information, enables the management of "ATC Requested" tactical holding in an effective and efficient manner. Utilizing the representative properties of a trajectory point: "Initiated" & "Terminated", the same trajectory point can be pushed in to "Agreed" and "Executed" trajectories or twice in "Agreed" or in "Executed" trajectories representing entry and exit from hold at different point in times and phase of flight.

2.10   GCAA's 4D Trajectory model has been created in a bid to showcase the practical representation of the B3 – FICE concept for Flight & Flow Information. It certainly enhances the accuracy, integrity and completeness of information exchange amongst ANSPs and other stakeholders, thereby acting as one of the enablers for operations such as TBO, DCP, ATFM, CDM, PBN etc.

3.   **ACTION BY THE MEETING**

3.1   The meeting is invited to:

  a) Note the progress made for the design, development and implementation of 4D Trajectory model

  b) Invite ICAO and States to work collaboratively to develop an effective FF-ICE model suitable for the MID region to ensure that we meet the upcoming ASBU block requirements.

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