International Civil Aviation Organization

MIDANPIRG/22 & RASG-MID/12 Meetings

(Doha, Qatar, 4 – 8 May 2025)

Agenda Item 7: Any other Business

PROPOSAL FOR ESTABLISHMENT OF A DEDICATED ENVIRONMENTAL WORKING GROUP (ENV WG) TO SUPPORT ALL ATM RELATED ENHANCEMENTS

(Presented by Qatar)

SUMMARY

This Information paper outlines the need for the establishment of a dedicated Environmental Working Group (EnvWG) in the MID Region to support all ATM related enhancements starting by the integration of CO_2 emissions tracking into trajectory-based operations under Flight and Flow Information for a Collaborative Environment (FF-ICE).

Action by the meeting is at paragraph 3.

1. INTRODUCTION

1.1 **Global Environmental Objectives:** International aviation faces increasing pressure to reduce its carbon footprint in support of global climate goals. The 41st ICAO Assembly in 2022 adopted a long-term aspirational goal of net-zero carbon emissions by 2050 for international aviation. Achieving this **requires integrating environmental considerations into air navigation planning and operations**. Operational improvements in Air Traffic Management (ATM) – such as trajectory optimization – are recognized as a key element of ICAO's "basket of measures" to reduce CO_2 emissions.

1.2 **Trajectory-Based Operations and FF-ICE:** In parallel, the aviation industry is transitioning towards Trajectory-Based Operations (TBO) through the implementation of FF-ICE, a modern flight information sharing framework. FF-ICE shifts ATM from traditional message-based flight plans to a **shared, dynamic 4D trajectory model** that supports collaborative decision-making and improves flight efficiency and predictability. By enabling more efficient flight trajectories and better flow management, FF-ICE has inherent environmental benefits (e.g. reduced fuel burn and emissions from shorter or optimized routes). However, to fully realize these benefits in the MID Region, **CO_2 emissions need to be explicitly tracked and managed as a parameter within the FF-ICE/TBO framework**.

1.3 **Regional Context:** The MID Region has begun laying the groundwork for FF-ICE implementation. MIDANPIRG/21 (March 2024) established the Airspace Management Working Group (ASM WG) to advance initiatives like Free Route Airspace and FF-ICE in a harmonized manner. Guidance material for FF-ICE regulatory frameworks has been developed (ref. MIDANPIRG/22-WP/87) to assist States in adopting national regulations for FF-ICE. *Environmental aspects*, however, have not yet been addressed in depth. There is a growing recognition that **a coordinated regional approach is needed to incorporate emissions monitoring into FF-ICE deployment**, ensuring that

all MID States align with both global ATM modernization and ICAO environmental policies.

2. DISCUSSION

INTEGRATING CO_2 EMISSIONS INTO FF-ICE TRAJECTORY PLANNING

2.1 **Emissions as a Trajectory Parameter:** The FF-ICE concept (ICAO Doc 9965) provides for environmental metrics to be included in flight information exchanges. Notably, it defines an *"Emissions performance"* information field describing the environmental emissions impact of a flight based on how it will be operated. The inclusion of this data in the trajectory planning process allows stakeholders to develop and assign specific procedures or constraints based on an individual flight's emissions performance. In practical terms, this means that when collaborative trajectory decisions are made (e.g. selecting routings, altitudes, or departure times in the strategic phase), the expected CO_2 output can be considered alongside traditional factors like time, airspace capacity, and weather. This capability aligns FF-ICE with ICAO's goal of performance-based navigation that encompasses environmental performance.

2.2 The **Supporting Collaborative Decision-Making:** By integrating emissions data, FF-ICE can support more environmentally informed **collaborative decision-making** among stakeholders (ANSPs, airline operators, airports, etc.). For example, airline flight plans could include expected fuel burn and CO_2 emissions for the proposed 4D trajectory. Air traffic flow management systems, via FF-ICE, could then identify options to minimize unnecessary fuel consumption (such as avoiding extended airborne holding or enabling user-preferred trajectories) and negotiate adjustments before flight departure. This dovetails with FF-ICE's core objective to improve flight efficiency and predictability. In essence, **every trajectory proposal under FF-ICE could be evaluated not only for safety and efficiency, but also for its carbon impact**, making environmental efficiency a key performance parameter in TBO.

2.3 **Alignment with ICAO Environmental Goals:** Integrating CO_2 tracking into FF-ICE directly supports ICAO's environmental goals and initiatives. It provides a practical operational measure to contribute toward the net-zero 2050 vision by reducing emissions through optimized ATM. It also complements programs like the State Action Plans and CORSIA by giving States real-time data on emissions performance of flights. In the MID Region, where States have committed to reducing aviation emissions in line with global agreements, leveraging FF-ICE for environmental benefit demonstrates leadership and concrete action. This approach ensures that **ATM improvements (through FF-ICE/TBO implementation) translate into measurable environmental improvements**, closing the gap between air navigation progress and climate objectives.

NEED FOR HARMONIZED CO_2 MONITORING AND MANAGEMENT MECHANISMS

2.4 **Importance of a Common Approach:** To effectively use emissions data in trajectory-based operations, the MID Region must adopt **harmonized methods for monitoring, calculating, and sharing CO_2 emissions**. A common methodology for estimating flight emissions (e.g. based on fuel burn modeling or approved tools) should be agreed so that all States and airlines are using consistent data. If each State were to implement emissions tracking differently, the disparities could undermine collaborative decisions – for instance, an optimized trajectory in one FIR should be recognized as such across the region. As noted in WP/87, having a standardized, data-driven framework across States promotes consistency and ensures the overall quality and coherence of regional implementations. Applying this principle to emissions means establishing regional standards (or guidance) for how CO_2 is quantified and reported in FF-ICE flight plan submissions and updates.

2.5 **Integration into FF-ICE Data Exchange:** FF-ICE information exchanges rely on globally standardized data formats (FIXM – Flight Information Exchange Model). The inclusion of

emissions information should leverage these existing standards to enable interoperability. This could involve using defined fields (such as the "Emissions performance" field of FF-ICE) or developing region-specific extensions if needed, in coordination with ICAO provisions. The objective is that **emissions data becomes a normal part of the shared flight information**, accessible to all authorized stakeholders for decision-making. According to the draft MID regional FF-ICE framework, the goal is a collaborative environment where flight information (including trajectory data and related performance parameters) is globally standardized and shareable among all ATM community members. By treating CO_2 metrics as another performance parameter within FF-ICE, the region can foster enhanced situational awareness and contribute to *global performance targets in air navigation* – which today include environmental targets alongside capacity and efficiency.

2.6 **Monitoring and Management:** Beyond initial integration, there will be a need to continuously **monitor and manage CO_2 emissions** in relation to FF-ICE operations. This could entail tracking baseline emissions on key city pairs or routes, monitoring improvements as FF-ICE and TBO measures are implemented, and sharing these insights regionally. States could use the data to inform their environmental reports and to identify further ATM improvements (e.g. airspace redesign, speed management, or climb/descent profile improvements) that yield emissions benefits. A harmonized regional mechanism – possibly in the form of a common data repository or dashboard – could be developed to compile CO_2 emissions data from FF-ICE flight plans. This would enable MIDANPIRG and States to **collectively assess progress towards emissions reduction through operational measures**, in line with ICAO guidance. It would also facilitate reporting and feedback into ICAO's global environmental assessment processes (for example, input to the ICAO Environmental Report or to future GANP updates regarding environment KPIs).

REGIONAL COORDINATION AND DATA-SHARING INFRASTRUCTURE REQUIREMENTS

2.7 **FF-ICE Data Exchange Infrastructure (SWIM):** Integrating emissions tracking will place additional requirements on the underlying data-sharing infrastructure. FF-ICE implementation in the MID Region is predicated on **System Wide Information Management (SWIM)** principles, which provide the digital ecosystem for sharing ATM data (flight plans, trajectory updates, meteorological data, etc.) in real time. WP/87 highlights that ANSPs must provide the necessary communication network and information management infrastructure – for example, *"SWIM-compliant messaging systems, secure internet connections, message brokers, etc."* – to transport and distribute FF-ICE data, with sufficient capacity and reliability for the increased volume and richness of information. CO_2 emissions data, while not large in size, is part of this "rich" information set and must be handled securely and efficiently. It should be seamlessly attached to flight objects and accessible to all relevant systems (ATC automation, flow management tools, airline ops centers) via the SWIM environment. Ensuring that **every FF-ICE message or trajectory dataset can carry emissions information across systems** will likely require updates to interfaces and databases, which should be coordinated regionally to maintain interoperability.

2.8 **Regional Harmonization and Collaboration:** Experience has shown that advanced ATM concepts like FF-ICE yield the most benefit when implemented in a harmonized way across a region. **Regional coordination is therefore critical** for the successful integration of CO_2 tracking. MIDANPIRG/22-WP/87 underlined that FF-ICE implementation is most effective when States act in concert: States are urged to coordinate their FF-ICE plans with neighbors and through ICAO regional groups, to participate in regional task forces or trials, to share best practices, and to agree on interface standards/agreements for cross-border data exchange. The same collaborative approach is required for the environmental dimension of FF-ICE. All MID States will need to agree on the data-sharing protocols for emissions and on how to handle CO_2 information when a flight crosses FIR boundaries. This might involve, for example, common procedures for handing off the emissions data along with the 4D trajectory when a flight moves from one ANSP to another, or region-wide acceptance of certain tools for estimating in-flight fuel burn. Close coordination ensures that an aircraft's emissions data **"filed**

once" is available to all relevant ATC units along its route without re-entry or loss of information, analogous to the goal for flight plan data sharing.

2.9 **Leveraging Existing Structures:** The MID Region already has mechanisms to coordinate complex ATM implementations. The MID ASM WG is tasked with developing a regional FF-ICE transition plan, demonstrating a model of collaboration on technical and operational matters. There have also been joint efforts with the APAC Region (e.g., the APAC FF-ICE Ad Hoc Group) to ensure inter-regional alignment. Building on these structures, it would be beneficial to have a forum specifically dedicated to **environmental coordination** in ATM. This forum would interface with existing groups (e.g., ATM Sub-Group, AIM Sub-Group, ASM WG) to inject environmental requirements into their work (for instance, ensuring the regulatory frameworks and interface control documents they develop include provisions for emissions data). Effective coordination will also mean engaging all relevant stakeholders: airspace users (airlines), airport operators, and regulators, so that the approach to emissions in FF-ICE is comprehensive. The proposed Environmental Working Group can serve as this coordinating body, working in tandem with other sub-groups to avoid duplication and ensure consistency.

JUSTIFICATION FOR AN ENVIRONMENTAL WORKING GROUP (ENVWG) IN MIDANPIRG

2.10 **Need for a Dedicated Group:** CO_2 emissions reduction in aviation is a cross-cutting issue that overlaps operational improvements, technological systems, and state environmental commitments. **Establishing a dedicated Environmental Working Group under MIDANPIRG would provide the focused attention and expertise needed to drive all ATM related enhancements.** While existing groups handle airspace and technical aspects (ASM WG, ATM SG, etc.), a specialized EnvWG can concentrate on the environmental performance of the regional ATM system. This group would fill the current gap in the MID region's working structure by addressing how **environmental data and objectives can be integrated into air navigation planning** on an ongoing basis. Importantly, it would align the MID region with global best practices – for example, other ICAO regions and the ICAO Committee on Aviation Environmental Protection (CAEP) encourage regional coordination on operational measures to reduce emissions.

2.11 **Scope and Tasks of the EnvWG:** The EnvWG would have the following indicative tasks and responsibilities:

- **Coordinate Harmonization:** Ensure all MID States adopt harmonized mechanisms for CO_2 monitoring. This involves facilitating agreements on common tools and data standards, and potentially developing a regional emissions data repository or dashboard as mentioned.
- **Data Sharing and Infrastructure:** Work with the CNS/SWIM experts to implement the necessary infrastructure enhancements so that emissions information is shared seamlessly via SWIM. The EnvWG can identify any gaps in the current data exchange network related to environmental data and recommend solutions.
- **Collaborative Decision-Making Processes:** Develop use cases and protocols for how emissions data will be used in ATFM/ATM decision-making. For example, the group can simulate scenarios of flow management where flights might be given routing preferences based on lower emissions, and ensure procedures are in place for such coordination.
- **Support States and Monitor Progress:** Act as a platform for MID States to share experiences, lessons, and best practices on reducing emissions through ATM. The EnvWG can monitor regional metrics (fuel savings, CO_2 reductions achieved via new procedures like free route airspace or improved flow management) and report these to MIDANPIRG, demonstrating progress toward ICAO's environmental goals. This also provides a feedback loop to global ICAO bodies on the effectiveness of operational measures.

2.12 **Working Group Structure:** Membership should include experts from States' ANSPs (with both ATM and technical backgrounds), airline representatives (flight operations and environmental strategy personnel), airport authorities, and regulators or planning officials. The EnvWG would naturally coordinate closely with the ATM Sub-Group and ASM WG. In fact, WP/87 already proposes that **an existing sub-group (ATM SG) be assigned tasks of reviewing and refining FF-ICE guidance material in coordination with the AIM SG**. This underscores the value of cross-discipline collaboration. The EnvWG, once established, could similarly coordinate with these groups – for instance, feeding environmental requirements into ATM planning.

2.13 **Precedents and Benefits:** The approach of forming a focused working group for specific challenges is well-proven in the MID Region. As noted in global forums, the inclusive and coordinated approach via regional groups is essential for complex implementations. The ICAO Air Navigation Conference (AN-Conf/14, 2024) stressed the benefits of establishing regional focus groups to coordinate and monitor FF-ICE implementation. By extension, a focus group on environment in ATM will ensure **no aspect of FF-ICE implementation is overlooked**, particularly the critical objective of emissions reduction. The EnvWG will act as a driving force to keep environmental performance on the agenda during FF-ICE rollout. It will help **MIDANPIRG to proactively address environmental sustainability** in tandem with capacity and efficiency improvements, thereby demonstrating the region's commitment to a balanced approach in accordance with ICAO's vision. Moreover, this initiative will position the MID Region as a leader in integrating ATM and environmental management, potentially providing lessons and templates that other regions could follow in the future.

3. ACTION BY THE MEETING

3.1 The meeting is invited to note the information contained in this paper.

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