

Report of ATMRPP-WG/44 & WG/45

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SUMMARY

This report details the key developments and work arrangements from the ATMRPP-WG/44 and WG/45 meetings held in 2024, as well as highlight the significant outcomes from the Fourteenth Air Navigation Conference (AN-CONF/14) related ATMRPP.

1. INTRODUCTION

- 1.1. The Air Navigation Commission (ANC) has been developing the concept for global Air Traffic Management (ATM) system since 1997. The ANC established the Air Traffic Management Operational Concept Panel (ATMCP) in 1998 to develop standards, procedures and guidance materials for an integrated global ATM system. In 2004 the panel was renamed the Air Traffic Management Requirements and Performance Panel (ATMRPP) to focus on defining performance requirements as a foundation for Standards and Recommended Practises (SARPs) development.
- 1.2. The ATMRPP regularly studies and reviews technical provisions and supporting the integration of the Global Air Navigation Plan (GANP). Its mission also included developing concepts and provisions that aligns with the vision of the Global ATM Operational Concept (GATMOC¹), to achieve a unified and efficient global ATM system.
- 1.3. The GATMOC presents the vision to achieve an interoperable global ATM system, for all users including manned or unmanned vehicles, during all phases of flight, that interacts with other trajectories and hazards to achieve the optimum system outcome, while also meeting agreed levels of safety, optimum economic operations, environmental sustainability and national security requirements.
- 1.4. To achieve this vision, it is essential to have global information utilisation, management, and interchange in a safe, secured and timely manner. This is the essence of Trajectory-Based Operations (TBO), which represents a

¹ GATMOC: ICAO Doc 9854 – a comprehensive guidance document to guide the evolution of Air Traffic Management (ATM) systems globally

fundamental shift in air traffic management to support the evolution towards a holistic, cooperative and collaborative decision-making environment, within which the interests and expectations of all ATM stakeholders are considered and balanced, enabling the creation of precise flight trajectories that optimise airspace capacity and efficiency.

1.5. There are a few essential enablers and concepts required to achieve TBO. This includes the following:

- Flight and Flow Information for a Collaborative Environment (FF-ICE) – new flight planning format that will replace the current FPL2012. It contains more data to enable collaborative decision making amongst all stakeholders, including airlines, Air Traffic Control Officers (ATCOs) and airport operators.
- System Wide Information Management (SWIM) – framework of data and security standards to enhance the exchange of information in ATM, shifting from traditional point-to-point communication model to an integrated, system-wide approach, to enable seamless and secure information sharing among stakeholders
- Connected Aircraft Concept (work in progress) – a framework guiding the use of performance-based communication links, with the integration of advanced communication technologies to enable continuous connectivity between aircraft and ground systems, to allow real-time data transmission. This connectivity enhances operational efficiency, safety, and passenger experience.

1.6. Mr Lim De Wei has been the IFATCA's representative to the ATMRPP since 2021. The work to develop future ATM concepts had been challenging with twice a year week-long meeting, and regular working group meeting outside of this. However, the process had also been very meaningful and rewarding. This was made possible with the generous support from the Civil Aviation Authority of Singapore and IFATCA.

2. DISCUSSION

2.1. The following paragraphs will share the key developments and work arrangements from the ATMRPP-WG/44 and WG/45 meetings held in 2024, as well as share the significant outcomes from the Fourteenth Air Navigation Conference (AN-CONF/14) related to the work of ATMRPP.

Outcomes from the AN-CONF/14 related to ATMRPP

2.2. There were a few important outcomes arising from AN-CONF/14 that would impact air traffic management and the role of ATCOs in the future. They are as follows:

- Recommendation 3.1/3 – Enabling successful deployment of trajectory-based operation

- Recommendation 3.2/2 – Transition to Flight and Flow Information for a Collaborative Environment services and cessation of ICAO 2012 flight plan by 2034
- Recommendation 4.1/1 – Validation, standardization and implementation of the connected aircraft concept and air-ground connectivity strategy

2.3. The following paragraphs will elaborate further on the recommendations and the related scope of work for ATMRPP.

AN-CONF/14 Recommendation 3.1/3 – Enabling successful deployment of trajectory-based operation

Global cessation of FPL 2012

- 2.4. During the AN-CONF/14, ICAO secretariat presented WP 11 titled “Cessation of ICAO 2012 Flight Plan by 2034”, which proposed for a target date for the cessation of FPL2012. The paper discussed on the difficulty of operating in a prolonged period of mixed-mode operations², as it would incur additional resources to support both modes of flight planning (FPL2012, FF-ICE), conversely slowing down the implementation of TBO, and negating the expected benefits.
- 2.5. This recommendation was subsequently endorsed by ICAO, expressing the urgency to sunset FPL2012 and work towards FF-ICE implementation to enable TBO.
- 2.6. As ATMRPP recognised the need for a harmonisation of national, regional and global efforts to ensure successful implementation of FF-ICE, there was a new job card being drafted to identify all the essential task and provide the necessary guidance to help with this transition process, in collaboration with other expert groups such as Information Management Panel. There was an emphasis on the priority for global standardisation activities.

TBO capabilities by levels

- 2.7. There is on-going work to categories and define TBO capabilities by levels. This is to make it easier for ANSPs to achieve TBO in levels and encourage a phased implementation to ease the transition. The current definitions (draft) include:
- Pre-TBO – limited information exchange by AUs and ASPs
 - Level 1 – perform pre-departure agreed trajectory negotiation
 - Level 2 – conduct agreed trajectory execution and negotiation and use updated trajectory information from AU during flight execution
 - Level 3 and 4 – to be defined

² Mixed-mode operations: A period of ATM operations involving ASPs and AUs operating via both FPL2012 and FF-ICE

- 2.8. ATMRPP is also working on a transition guidance to help Airspace Users (AUs) and ATM Service Providers (ASPs) adjust their operations to attain the various TBO levels.

FF-ICE developments in Asia Pacific (APAC)

- 2.9. The APAC ANSP Committee has initiated a project involving APAC ANSPs and International Organisations to work on a harmonised and expedited implementation of the ICAO global TBO concept in APAC, known as the APAC TBO Pathfinder Project.
- 2.10. The deliverables of the Pathfinder project include communication of the global ICAO TBO concept to regional ANSPs, building up capabilities through validation exercises including Tabletop Exercises (TTX) and Lab demonstrations, conducting a TBO analysis report to quantify TBO operational values, and lastly to deliver a TBO implementation roadmap for the region.

AN-CONF/14 Recommendation 3.2/2 – Transition to Flight and Flow Information for a Collaborative Environment services and cessation of ICAO 2012 flight plan by 2034

FF-ICE Implementation in Europe

- 2.11. In Europe, the Commission Implementing Regulation (EU) 2021/116 Common Project 1 (CP1³), as part of the Single European Sky ATM Research (SESAR), has mandated for IFR General Air Traffic (GAT) Airspace Users (AUs) operating in the European Air Traffic Management Network (EATMN) airspace to adopt FF-ICE and start filing FF-ICE flight plans with the implementation target date of 31 Dec 2025. The FF-ICE services available include Filing, Flight Data Request, Trial, Data Publication and Notification Services.
- 2.12. Currently, the Network Manager (NM), as a provider of FF-ICE services, helps to translate accepted FF-ICE submissions into FPL 2012 message structures for ANSPs who are not yet FF-ICE enabled. The translation service will continue as long as there are non-FF-ICE enabled ANSPs, supporting various FF-ICE services and processes.
- 2.13. The lessons learnt in handling the different flight plan formats being translated, would provide valuable insights to implementation challenges.

Harmonisation between Europe and USA on FF-ICE/R2

- 2.14. Both Europe and the USA had been taking the lead in the research and development of TBO concept and its enablers. While the high-level processes were generally consistent between the organisations, there were some

³ CP1 - Common Project One: a European regulation that sets out essential requirements for the implementation of air traffic management (ATM) functionalities to enhance the performance of the European aviation system

variation going into the finer details. Currently, there is a SESAR-FAA MoC to discuss on the harmonisation of FF-ICE/R2⁴ concept.

- 2.15. The US/Europe team will conduct an analysis to work on the identified differences and include IATA to further refine the FF-ICE/R2 processes, as the AUs would be one of the key players in the trajectory negotiation process. There is a planned TTX to be held back-to-back with ATMRPP-WG/47 in Oct 2025, to include a wider set of stakeholders to help further validate and consolidate feedback on the FF-ICE/R2 processes.

Recommendation 4.1/1 – Validation, standardization and implementation of the connected aircraft concept and air-ground connectivity strategy

Connected Aircraft

- 2.16. The Connected Aircraft (CA) concept involves using various communication links, including both protected and non-protected spectrum. Some applications require a certain level of performance, which can be achieved through either type of links. This is achieved through “multi-link” or “hyper-connectivity”, where different link performances are monitored, evaluated, and selected for the application’s need. In hyper-connectivity, both protected and non-protected links can be used if they meet the performance requirements.

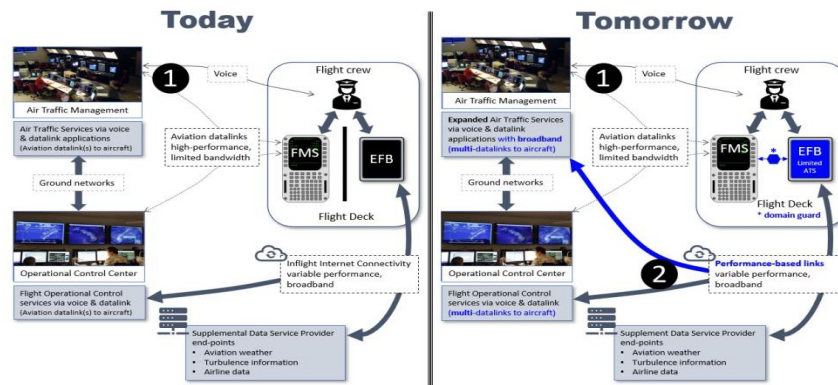
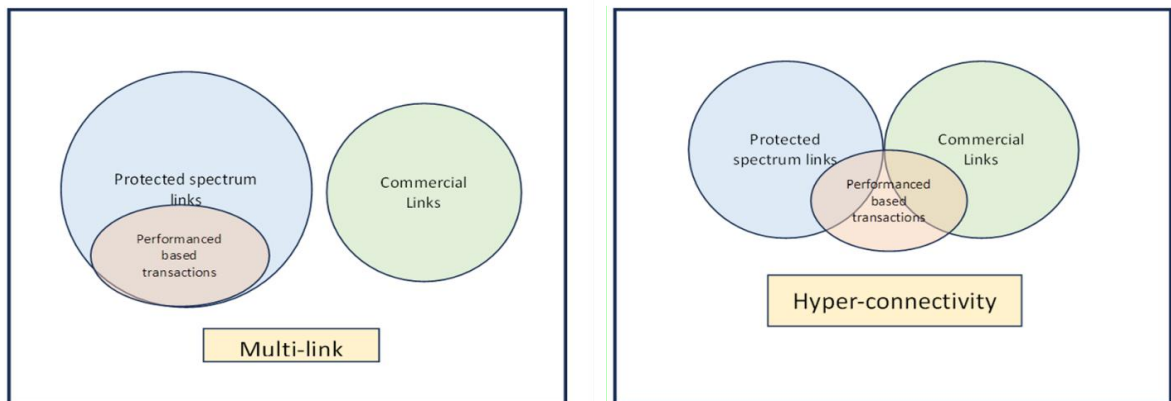


Figure 1: Change brought about by Connected Aircraft Concept Source: FAA

⁴ FF-ICE/R2: refers to FF-ICE message exchange post departure

- 2.17. The concept of Hyper-connected ATM builds upon the CA concept by using non-safety critical “off-the-shelf” air-ground communication links as an additional means to support safety-critical communication. It also includes proposed solutions for air-ground communication infrastructure and operations, supporting air traffic services, aeronautical information service and



aeronautical operational control.

Figure 2: Linkage between commercial links in multi-link and hyper-connectivity
Source: FAA

- 2.18. It is recognised that there is a growing demand for air-ground connectivity, and thus the urgent need for secure, scalable, cost-efficient and spectrum-efficient air-ground data links that offer a handle more capability and have better performance. There is further work at ATMRPP to expand the CA concept to incorporate such considerations, and to further develop, validate and standardise the concept, including certification and implementation.

Regional Validation Exercises

- 2.19. There had been a noticeable effort from the APAC region to prioritise TBO implementation, as evident from the various TBO validation activities together with like-minded ANSPs and organisations. Some examples are shared as below.
- 2.20. The Korea Civil Aviation Office held an FF-ICE/R1 TTX, in close coordination with EUROCONTROL, Nav Canada and JCAB, at the Korea National Aviation Museum, from 25-26 April 2024. It was facilitated and attended by many ATMRPP members and advisors. The objectives of the TTX were to raise awareness of the FF-ICE/R1 services, providing the opportunity for the aviation stakeholders in Korea to clarify and understand their roles and responsibilities.
- 2.21. An FF-ICE/R2 TTX conducted in Bangkok, Thailand, from 16 to 20 December 2024, in a joint collaboration between AEROTHAI, CAAS and FAA. The objectives of the TTX were to provide a basic understanding of the FF-ICE/R2 concept to regional stakeholders in Asia/Pacific and to discuss the feasibility of applying FF-ICE/R2 in the APAC region, where FIRs are relatively small and fragmented. This would be a concern as the timeline available for trajectory

negotiation in between FIRs could be limited. The key discussion pointers would be surfaced to ATMRPP for consideration in their policy formulation.

- 2.22. China conducted a multi-aircraft TBO simulation validation in China, focusing on mid-term conflict detection, consistency monitoring, arrival management, and intelligent flight Required Time of Arrival allocation based on the airborne predictive trajectory. The validation activity also examined system functions, operational processes, and human-machine interface of the next-generation ATM system. The validation demonstrated that the airborne predictive trajectory could effectively assist ATCOs in making intelligent decisions, while improving the safety and efficiency of flight operation.

3. CONCLUSION

- 3.1. The development of TBO represents a significant milestone in the evolution of global air traffic management, and it requires the collaborative efforts of all the aviation stakeholders and industry to support the implementation in a timely manner, with standardised and harmonised global rules and procedures, to achieve overall operational efficiency and safety, as well as environmental sustainability.
- 3.2. As ATMRPP continues to work on the concept development of TBO and related enablers, it is also important for ANSPs and relevant stakeholders to continue refining and validating the TBO concepts through regional validation exercises and conduct engagement exercises to bring awareness to others in the region. The lessons learnt would provide valuable insights that can be shared with ATMRPP, to further enhance the TBO concept, and address any challenges that may arise during implementation.
- 3.3. The IFATCA representative will continue to participate and contribute to the work at ATMRPP, taking care to ensure that the policies and procedures are properly developed and calibrated to ensure ATCOs are still able to perform their primary role and would not be negatively impacted, and are able to transit to the new role safely.

4. RECOMMENDATIONS

- 4.1. It is recommended that this report be accepted as information paper.

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