



WORKING PAPER

FOURTEENTH AIR NAVIGATION CONFERENCE

Montréal, Canada, 26 August to 6 September 2024

- Agenda Item 3: Air Navigation System Performance Improvement**
3.3: Eighth Edition of the Global Air Navigation Plan (GANP)

UPDATES TO THE GLOBAL AIR NAVIGATION PLAN (GANP)

(Presented by Saudi Arabia)

EXECUTIVE SUMMARY

The Assembly Resolution A41-6: ICAO Global Planning for Safety and Air Navigation endorsed the seventh edition of the *Global Air Navigation Plan* (GANP, Doc 9750). The GANP drives the evolution of the global air navigation system and provides a series of operational improvements to increase capacity, efficiency, predictability, and flexibility while ensuring system interoperability and process harmonization.

This paper provides an overview of the ongoing ANS-related development that should be considered in revising the global technical level to incorporate new concepts such as low-level operations for unmanned aircraft systems (UAS), Advanced Air Mobility (AAM), UAS traffic management (UTM), higher airspace operations (HAO), and artificial intelligence (AI) in the eighth edition of the GANP.

Action: The Conference is invited to:

- a) note the information provided in this paper;
- b) discuss and recommend a revision of the global technical level to incorporate new concepts such as low-level operations for UAS, Advanced Air Mobility, UTM, higher airspace operations, and artificial intelligence (AI) during the development of the eighth edition of the GANP;
- c) urge all Member States that have experience with new entrant operations and air navigation system (ANS) innovation to share their experience with other States through ICAO;
- d) call upon ICAO to explore the possibility of defining a new thread encompassing ANS innovation, as the current GANP Aviation System Block Upgrade (ASBU) functional categories (information, operational and technology) may not be appropriate to cover ongoing and planned development and transformation; and
- e) call upon ICAO to adopt the validated use cases for new entrants and innovation in the development of guidance material to support the deployment and implementation of the ASBU upgrades.

1. INTRODUCTION

1.1 The Assembly Resolution A41-6: ICAO Global Planning for Safety and Air Navigation endorsed the seventh edition of the *Global Air Navigation Plan* (GANP, Doc 9750). The Global Air Navigation Plan (GANP) drives the evolution of the global air navigation system and provides a series of operational improvements to increase capacity, efficiency, predictability, and flexibility while ensuring system interoperability and process harmonization. The GANP is supported by the *Global Aviation Safety Plan* (GASP, Doc 10004).

1.2 The ICAO Assembly, during its 39th Session, agreed on the adoption of the GANP lifecycle through three -year minor and six-year major updates, as relevant, to meet the need for stability and to ensure that regional and State ongoing operational improvements and initiatives remain aligned with the GANP Aviation System Block Upgrades (ASBUs). While the seventh edition of the GANP, endorsed by the ICAO Assembly, during its 41st Session, contained minor updates, it is expected that the eighth edition will contain major updates that will be submitted to the upcoming ICAO Assembly for endorsement.

1.3 As proposed by the ICAO Secretariat, the eighth edition of the GANP will develop a fresh approach focusing on resilience and environment while working towards the digitalization of a fully connected air navigation system (A41-WP/45 refers).

2. DISCUSSION

2.1 The GANP covers global ambitions for air navigation system (ANS) modernization. It drives the evolution of the global air navigation system, targeting the safe, secure, and cost-effective accommodation of all airspace users and new entrants' operations while reducing environmental impact.

2.2 To meet the global objectives, the GANP is defining a series of operational improvements, i.e., Aviation System Block Upgrades (ASBUs), to increase capacity, efficiency, predictability, and flexibility while ensuring the interoperability of functional systems and harmonization of working methods and procedures. The GANP is supported by the *Global Aviation Safety Plan* (GASP, Doc 10004) and the *Global Aviation Security Plan* (GASeP) (Doc 10118).

2.3 The ASBUs outline the evolution of air and ground equipment over time, targeting all segments of the ANS network, operations, and services. They focus on four performance improvement areas: airport operations, global interoperable systems and data, optimum capacity and flexible flights, and efficient flight paths. The ASBUs are organized into 'threads' and 'elements' under three functional categories (information, operational, and technology) that together will, over time, deliver the targeted performance improvements.

2.4 Although the GANP targets harmonizing the global evolution of ANS to accommodate all airspace users, the plan does not cover ongoing innovation and New Entrants' operations that have a potential impact on the aviation ecosystem. Many studies and forecasts indicate that within the next decade, demand and technological improvements will result in millions of commercial New Entrants (unmanned aircraft systems (UAS) and higher airspace operations (HAO)) flights per day.

2.5 The growing market for the operation of UAS shows significant potential worldwide, particularly for low-level airspace flights, including in urban cities where many aircraft manufacturers and start-up companies have developed aircraft concepts for flying completely electrical for air taxi services. The electric vertical take-off and landing (eVTOL) aircraft are at an advanced stage of certification and introduction into service. Thus, dedicated ASBU threads and elements are urgently needed to achieve global harmonization and the smooth and safe integration of UAS and eVTOL into the airspace.

2.6 During the Future Aviation Forum (FAF 2024) held at the King Abdulaziz International Conference Centre in Riyadh, Saudi Arabia, from 20 to 22 May 2024, a dedicated Advanced Air Mobility Pavilion displayed a full-scale mock-up of eVTOL aircraft for the transportation of passengers and goods. In addition, during this forum, the General Authority of Civil Aviation (GACA) presented the Advanced Air Mobility Roadmap¹, which aims to the safe integration of emerging technologies into the current national navigation system. The roadmap covers seven pillars with a focus on the verification and validation of performance-based requirements of individual eVTOL, as well as the assurance that the flights and surrounding ecosystem meet desired safety targets. With this respect, several eVTOL test flights were conducted, especially in NEOM, and there is a plan to extend these tests during 2024 to

¹ A copy was provided to ICAO Secretariat to be considered in the development of a holistic vision and framework regarding AAM.

ensure that the low-level airspace operations are safe and that the New Entrants can operate safely with conventional aviation activities.

2.7 The diversity of ongoing innovation, testing, and the development of new technologies supporting New Entrants, i.e. the HAO show the need for global and common standards to support safe, secure, and sustainable civil aviation operations in higher airspace, typically above the flight levels used by conventional aircraft operations.

2.8 The variation in performance of New Entrants used for higher airspace, i.e. aerodynamic characteristics, speed, and flying altitudes, and the growing demand for applications such as offering telecommunications and internet services in remote areas, enhancing current weather Observation capabilities to monitor the climate change, and enabling transportation of people and goods, should be considered in setting the required priority for the development of ICAO HAO framework and updating GANP to introduce new ASBU elements to ensure global harmonization and safe integration of HAO.

2.9 Moreover, the growing use of artificial intelligence (AI), and specifically deep reinforcement learning (DRL) techniques, has shown promise for overcoming computational issues, resolving complex situations, and introducing improvements in ANS and decision-making approaches. In the AI domain, an agent refers to automation that identifies and selects actions to implement within a short time and resource optimization. Many AI applications were developed, such as efficient sequencing of taxiing aircraft, maintaining aircraft separation in congested airspace, air traffic flow management, advanced language understanding, and linguistic capabilities for air traffic control, where the results show promising future AI-based decision support capability. Therefore, the upcoming amendment to the GANP should consider the definition of ASBU threads and elements related to AI technologies and applications related to ANS innovation and modernization.

2.10 The Assembly Resolution A40-27: *Innovation in aviation*, acknowledges the real and potential benefits and challenges that innovation can bring to the safety, efficiency, security, facilitation and to the economic and environmental sustainability of air transport. It also recognizes that:

- a) ICAO provisions apply to all civil airspace users, and the absence of normative activity at the global level may hamper the realization of innovative technological solutions and prevent the materialization of their benefits in aviation; and to that end ICAO can benefit from continued interaction with industry to identify the latest technological developments their timely integration; and
- b) the nature and pace of innovations require regulators at the national, regional, and global level avail themselves of new methodologies that facilitate the timely evaluation and assessment of technological developments.

2.11 This resolution “directs the Council to assess the need, as well as the resources required, to evolve the Organization, including its working methods with the industry in order to keep pace with innovations that affect the sustainable development of civil aviation.”

2.12 Recalling that ICAO’s role is to provide global policies and develop the provisions that will support gradual and safe aircraft operations during all phases of the flights. To enable standardization, global harmonization, interoperability, and safe and efficient ANS modernization and innovation, it is recommended to consider the following proposals during the development of the eighth edition of the GANP:

- a) review the approach used for the accommodation of new entrants and ANS innovation;
- b) explore the possibility of defining a new thread encompassing ANS innovation, as the current functional categories (information, operational, and technology) may not be appropriate to cover ongoing and planned development and upgrades;

- c) update the conceptual roadmap and the vision to consider ANS innovation;
- d) review the global technical level to incorporate new concepts such as low-level operations for UAS, advanced air mobility (AAM), UTM, HAO, and AI;
- e) extend the ASBU framework and timeline to additional blocks;
- f) adopt the validated use cases for new entrants as guidance material to support the deployment and implementation of the ASBU upgrades;
- g) define workstreams or deployment packages for dependent operational improvements; and
- h) review the performance frameworks to identify potential indicators using a systematic approach mixing dimensions and measurements.

3. CONCLUSION

3.1 The 41st Session of the ICAO Assembly recognized that the rapid pace of new entrants (UAS and HAO), including the AAM ecosystem, calls for work to be undertaken by ICAO. It also recognized the potential need for a global harmonized framework and global provisions and guidance material. It agreed that the leadership role of ICAO is essential to achieving such harmonization.

3.2 As the GANP drives the evolution of the global air navigation system, targeting the safe, secure, and cost-effective accommodation of all airspace users and new entrants' operations, the upcoming edition of the plan needs to consider the ongoing development and planned ANS-related innovation and advancement.

3.3 The GANP ASBU framework should also be revised to extend the current upgrading blocks, update the global conceptual roadmap, and identify the deployment packages for dependant operational improvements considering ANS areas. It is also proposed to consider the adoption of a new ASBU thread related to innovation as the current functional categories may be inappropriate to accommodate and categorize the on-going and planned ANS innovation.

3.4 To support the implementation of ASBU threads and elements, ICAO, as a forum and facilitator for the development of frameworks and knowledge sharing on ANS modernization, can bring together States, and industry stakeholders, at both the global and regional levels to set Standards and Recommended Practices (SARPs), develop guidance material, share best practices on the concept of operations and requirements for safe and efficient integration of new entrants and innovation in the aviation ecosystem.

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