



## ASSEMBLY — 42ND SESSION

### TECHNICAL COMMISSION

#### Agenda Item 24: Aviation Safety and Air Navigation Priority Initiatives

#### SWIM-BASED SEAMLESS GLOBAL AVIATION INFORMATION EXCHANGE: PRACTICES AND RECOMMENDATIONS FOR FUTURE COLLABORATION

(Presented by China)

#### EXECUTIVE SUMMARY

This paper presents China's achievements in system-wide information management (SWIM)-based seamless global aviation information exchange, and proposes recommendations for future collaboration based on China's Civil Aviation Development Plan and China Civil Aviation SWIM Technical Framework and Implementation Roadmap (draft), to provide insights for the efforts to promote the accelerated development of the global aviation industry and globally harmonized operations.

**Action:** The Assembly is invited to:

- note the information contained in this paper;
- request ICAO to develop guidelines for the assessment of SWIM implementation outcomes, to provide guidance for Member States on self-assessment of SWIM implementation progress, and to facilitate the implementation of SWIM plans under the Aviation system block upgrade (ASBU) framework;
- request ICAO to establish a mechanism for the allocation and usage of globally unique flight identifiers (GUFIs) for cross-border flights;
- request ICAO to develop a technical framework for SWIM-based data flow and transactions; and
- encourage regional and national SWIM groups to actively contribute to seamless global aviation information exchange and future collaboration.

|                                |                                                                                                                                                                                                                              |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Strategic Goals:</i>        | This working paper relates to <i>Every Flight is Safe and Secure</i> .                                                                                                                                                       |
| <i>Financial implications:</i> | The activities referred to in this paper are expected to be undertaken with the resources available in the 2026-2028 Regular Budget and/or from extra-budgetary contributions as guided by the ICAO Business Plan 2026-2028. |

<sup>1</sup> English and Chinese versions provided by China.

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>References:</i> | <p>Annex 3 — <i>Meteorological Service for International Air Navigation</i></p> <p>Annex 10 — <i>Aeronautical Telecommunications</i></p> <p>Annex 15 — <i>Aeronautical Information Services</i></p> <p>Doc 10184, <i>Assembly Resolutions in Force</i> (as of 7 October 2022)</p> <p>Doc 10203, <i>Manual on the System-Wide Information Management (SWIM) Implementation</i></p> <p>Doc 10039, <i>Manual on the System-wide Information Management (SWIM) Concept</i></p> <p>Doc 9965, <i>Manual on Flight and Flow — Information for a Collaborative Environment (FF-ICE)</i></p> <p>Doc 9854, <i>Global Air Traffic Management Operational Concept</i></p> <p>Doc 9750, <i>Global Air Navigation Plan</i></p> <p>Doc 8126, <i>Aeronautical Information Services Manual</i></p> |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 1. INTRODUCTION

1.1 The Global Air Navigation Plan (GANP, Doc 9750), as the core strategic framework for the evolution of the global air navigation system, provides strategic guidance for the continuous optimization and innovation of the global air navigation system by establishing an interactive collaboration platform, integrating resources of various regions and States under a multi-tiered global architecture, and precisely coordinating the responsibilities and business processes of different parties. GANP identifies information management as a key enabler for achieving future global harmonization and interoperability, highlighting its pivotal role in cross-regional data exchange, system integration, and service coordination. Taking into account the system-wide information management (SWIM) implementation status and roadmaps of different regions and States, it supports information services for flight operation, air traffic flow, aeronautical information, aviation meteorology, airports, airlines, passengers, logistics, and network operations, and underpins future global civil aviation information management and services.

1.2 The Asia-Pacific Seamless Air Navigation Service Plan outlines the goals for the implementation of SWIM as follows: to establish basic information exchange service capabilities in the short term; to achieve the exchange of meteorological and aeronautical information as well as selected flight data in the medium term; and to aim for a SWIM-based air navigation model driven by trajectory-based operations (TBO), based on GANP and Aviation System Block Upgrade (ASBU), in the long term. In addition, the development of a SWIM General Information Services Catalogue is underway. These initiatives align with GANP and play a critical role in advancing the integration of information exchange-based Air Traffic Management (ATM) and Total Airport Management (TAM).

1.3 During SWIM development, multiple ICAO panels made significant contributions in their respective fields. The Air Traffic Management Requirements and Performance Panel (ATMRPP) defined the role of information management in future aviation systems from an operational concept perspective; the Communications Panel (CP) proposed key technical pathways for the infrastructure supporting SWIM; the Information Management Panel (IMP) focused on the building of information management frameworks and governance mechanisms, covering digital aeronautical information services, air-ground SWIM information services, interoperability of SWIM service registries, definitions of information services, enhanced SWIM governance, and information management terminology; and the Meteorology Panel (METP), on the other hand, promoted the integration and sharing of meteorological information in the SWIM environment from the application perspective. These collective efforts laid a solid foundation for the overall development of SWIM.

1.4 To advance the building of China's civil aviation SWIM system and integrate it into global aviation digitization, the Civil Aviation Administration of China (CAAC) has formulated both long-term and short-term plans, as well as the China Civil Aviation SWIM Technical Framework and Implementation Roadmap (draft). Under the current five-year plan, pilot projects will initially be conducted at hub airports, major airlines, and key air traffic control units to actively explore SWIM development paths and application models tailored to China's civil aviation sector; in the medium term, a nationwide SWIM platform covering the entire industry will be established to provide basic ground-to-ground information exchange services, and in the meantime ground-to-air information exchange projects will be piloted and data management standards improved. Looking ahead, efforts will focus on optimizing the layout of SWIM nodes at all levels, achieving unified registration and efficient supply of fundamental data services for collaborative operation based on ground-to-ground IP networks, completing the construction of aviation broadband infrastructure, continuously refining the data management policy framework, and building a nationwide integrated collaborative operation data platform. In non-critical business areas, SWIM verification and pilot applications will be carried out, based on which, high-quality aviation information services will be provided to stakeholders to further enhance the safety and efficiency of China's civil aviation operations.

## 2. DISCUSSION

2.1 CAAC has placed high priority on the development of the SWIM system and has achieved a series of significant outcomes in recent years. It has organized airlines, airports, and air traffic control units to sign agreements, which serve as implementation documents and specifications for operational data sharing. The aviation information network architecture has been continuously optimized, through the establishment of dedicated data platforms for flight operation, air traffic flow, aeronautical information, aviation meteorology, airports, airlines, passengers, and logistics, enabling the sharing and exchange of certain critical information.

2.2 In terms of SWIM-based seamless global aviation information exchange, CAAC has actively participated in the China-Japan-Korea SWIM Trilateral Validation Project. A validation scenario for the first phase of Flight and Flow — Information for a Collaborative Environment (FF-ICE/1) was established under the SWIM framework. As a member of the SWIM Implementation Pioneer Group (SIPG) in the Asia-Pacific region, CAAC has actively promoted SWIM sharing trials in the Asia-Pacific region, established the China node of the Asia-Pacific SWIM, and completed information sharing test connections with the other three gateway nodes and adjacent edge nodes.

2.3 In the process of SWIM implementation, Member States show significant differences in research, design, and implementation progress. Some Member States, leveraging their robust technical capabilities and efficient organizational coordination, have already completed system framework construction and operation, while others remain in the conceptual planning phase. To avoid fragmentation in SWIM implementation and the indirectly caused increase in implementation costs, and to enhance global interoperability and coordinated operation of SWIM, it is recommended to develop globally unified assessment guidelines to provide guidance for regions and Member States to carry out self-assessment, analyse gaps and issues, optimize implementation pathways, enhance construction efficiency, and promote the coordinated and unified application of SWIM globally.

2.4 The SWIM assessment guidelines should be developed based on the SWIM Concept Manual and the SWIM Implementation Guidelines, to support comprehensive evaluations across multiple dimensions such as information collection, information governance, information services, infrastructure, and application effectiveness. For example, the guidelines should specify the depth and breadth of information services covering flight operation, air traffic flow, aeronautical information, aviation

meteorology, airports, airlines, etc., establish and publish a priority information service list and priority data exchange catalogue, as well as a collection of safety and non-safety information, to enhance SWIM's information sharing interoperability, integrate industry resources, and better support the provision of standardized data services such as FF-ICE, TBO, TAM, and search and rescue (SAR) in the future.

2.5 The Globally Unique Flight Identifier (GUFID) is a key component of flight information exchange models and serve as an important reference for future global flight data integration and system interoperability. The United States and Europe have successfully implemented GUFID in operational environments. CAAC is actively advancing the development of domestic standards to specify domestic flight data formats, allocation methods, usage and transmission requirements, and conducting verification under multiple scenarios. To avoid conflicting standards or GUFID duplication during international flight operations in the future, Member States should establish a unified collaborative mechanism to ensure the uniqueness of GUFID for cross-border flights.

2.6 As the digital transformation of civil aviation accelerates, the application of big data and artificial intelligence technologies continues to advance, and the demand for data resource transactions continues to grow. Chinese airlines, airports, and air traffic control units are already exploring data transactions through data exchanges. For example, products such as airport geographic information system (GIS) maps, flight ground support node data, dynamic passenger flow data, air traffic control flight operation dynamics, and flight profiles have been listed on the Shanghai and Shenzhen data exchanges. In the future, data transactions will increasingly serve as a channel for data flow, with their proportion gradually growing. As a global interoperability technical framework, SWIM requires consideration of future civil aviation data flow needs and the development of relevant standards and specifications to provide guidance on the building of a global civil aviation data market and the development of a collaborative value-generation ecosystem.

### 3. CONCLUSION

3.1 It is recommended that ICAO develop guidelines for the assessment of SWIM implementation outcomes, to provide guidance for Member States on self-assessment of SWIM implementation progress, and to facilitate the implementation of SWIM plans under the ASBU framework.

3.2 It is recommended that ICAO establish a mechanism for the allocation and usage of GUFID for cross-border flights, to ensure the global uniqueness of GUFID for the same flight and to support the sharing and exchange of flight operation data in a collaborative operation environment.

3.3 It is recommended that ICAO develop technical standards and specifications for SWIM-based data flow and transactions, and further refine the SWIM Concept Manual and SWIM Implementation Guidelines.

3.4 Regional and national SWIM groups are encouraged to actively contribute to seamless global aviation information exchange and future collaboration, integrate industry resources, enhance global SWIM information sharing and interoperability capabilities, and support the future provision of standardized data services such as FF-ICE, TBO, TAM, and SAR, to ensure globally harmonized flight operations in the future.