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AGENDA ITEM 4: AIR NAVIGATION

**TOWARDS A SEAMLESS AND INTEGRATED AIRSPACE
SYSTEM TO MEET THE NEEDS OF THE FUTURE**

Presented by International Coordinating Council of Aerospace Industries Associations
(ICCAIA) and Civil Air Navigation Services Organisation (CANSO)

SUMMARY

Aviation faces unprecedented challenges, including increasing traffic volumes, diverse airspace users, and heightened sustainability expectations. Air Traffic Management (ATM) is the backbone of the aviation system, ensuring the safe, efficient movement of passengers and goods. While today's ATM systems continue to support extremely safe operations, some legacy architectures, fragmented implementation approaches and operational constraints increasingly limit the pace at which capacity, interoperability and new capabilities can be introduced. New technologies and implementation of currently available technologies have the potential to increase safety and operational efficiency. To realize these benefits, significant work has been undertaken to develop a shared vision for a future airspace system concept that integrates both current users and new entrants safely and seamlessly. A unified airspace system would do more than accommodate new operational concepts or users by providing a globally interoperable framework that leverages enhanced automation and real-time data sharing.

TOWARDS A SEAMLESS AND INTEGRATED AIRSPACE SYSTEM TO MEET THE NEEDS OF THE FUTURE

1. INTRODUCTION

1.1 Aviation is on the precipice of a transformative era, driven by both growing traffic demand and the arrival of groundbreaking technologies. Over the next 20 years, global air travel is forecast to experience significant growth, with passenger air traffic projected to more than double. New concepts of operation are rapidly becoming available across the aviation industry sector. Many of these innovations are possible through advancements in automation enabled by technologies such as big data, robotics, and artificial intelligence. Foundational change will be needed in the future to benefit from innovation and accommodate the anticipated growth in air transport as well as the integration of new and emerging forms of air transport at all strata of airspace. These innovations carry significant potential in improving aviation safety, sustainability, accessibility and affordability across the globe.

1.2 Today's airspace management system faces limitations. It operates under a patchwork of regulations, procedures and technologies, leading to challenges in coordination and communication between ANSPs, as well as service differences for airspace users. It remains highly fragmented, limiting flexibility in adapting to dynamic traffic demands. The lack of interoperability between legacy systems and emerging technologies also makes it difficult to manage increasing air traffic volumes and integrate new entrants. Furthermore, fragmented management complicates the implementation of global sustainability initiatives, such as reducing carbon emissions through optimized flight paths.

1.3 In addition, emerging forms of air transport are now mixing with conventional air traffic and operating in new airspace environments with different stakeholders. Drones, urban air mobility, commercial space operations and other types of higher altitude operations are rapidly becoming the norm and not the exception. Airspace is a finite resource, and the existing capacity of the global aerospace system will eventually limit air transport growth. It is widely recognized that we will eventually reach the limit of what current technologies can do, and innovative approaches are needed to safely allow air transport to grow.

2. DISCUSSION

2.1 In response to the above-mentioned challenges, the Civil Air Navigation Services Organisation (CANSO) organized a coalition of over 80 organizations including regulators, Air Navigation Service Providers (ANSPs), airspace users, airports, academia, aerospace manufacturers, drone operators, and Unmanned Aircraft Systems Traffic Management (UTM) service providers to develop a concept and plan for the future of ATM. Subsequently, the "Complete Air Traffic System (CATS) Global Council" developed the *Concept of Operations for Future Skies (CATS CONOPS)*.¹ This CONOPS serves as a strategic guide to creating a safe, seamless, efficient, and sustainable airspace management framework. It outlines a phased roadmap that would allow for a harmonized evolution of today's ATM system over the next two decades.

2.2 The CATS CONOPS also represents an important contribution to ICAO's ongoing work on a holistic vision for the Advanced Air Mobility (AAM) ecosystem and a forthcoming global concept for Higher Airspace Operations (HAO), both essential for achieving seamless airspace management. The CATS CONOPS long-term vision is an airspace where innovative and traditional users operate seamlessly within a single, integrated framework. However, full integration of ATM with UTM and HAO will require substantial transformation and collective effort.

¹ <https://futureskyvision.com/cats-conops/>

2.3 The CATS CONOPS outlines the guiding principles and strategic objectives, as well as the foundational transformation that will be needed in ATM to achieve the objectives, including critical enablers, and a three-phase structured pathway to delivering the future of ATM. Each phase represents a crucial stage in the progressive integration of foundational and advanced capabilities, as follows:

- a) **Phase 1: Airspace and Flight Optimization based on Advanced Digital Information Sharing** – digital transformation enabling more efficient airspace management and trajectory-based operations;
- b) **Phase 2: Advanced Automation and Real-Time Performance Management** – shift towards integrating advanced automation into safety-critical ATM; and
- c) **Phase 3: Seamless Airspace** – final phase realizing seamless, fully integrated airspace.

2.4 A highly automated ATM system will require a different approach to regulations. Looking towards the future, the regulatory focus should shift to specifying the required operational outcomes accommodating shorter innovation cycles, and new technologies to be tested in real-life environments while still maintaining a high standard of safety. Regulatory sandboxes, offering controlled environments for experimentation, have emerged globally as valuable tools for enabling innovation without compromising safety or operational integrity. A regulatory sandbox in aviation is a controlled, time-limited environment where innovators can test new products, services, technologies, or operational concepts under the supervision of a regulator. The goal is to facilitate innovation safely and responsibly, while gathering evidence to inform future regulatory frameworks. Regulatory sandboxes have been used by several Civil Aviation Authorities and regional organizations throughout the world including Brazil (ANAC), Canada (Transport Canada), United Kingdom Civil Aviation Authority (UKCAA), and EASA.

2.5 ICAO should play a central role in bringing about this evolution in a consistent and harmonized fashion. A primary objective of ICAO, as specified in the Convention on International Civil Aviation, is to foster the “planning and development of international air transport”. The ICAO Global Air Navigation Plan (GANP), including the Aviation System Block Upgrades (ASBUs), as well as the Global Air Traffic Management Operational Concept (GATMOC) are key planning documents used by the international civil aviation community and core mechanisms to achieve the ICAO objective. It will be essential to work through existing ICAO mechanisms to bring about change. The CATS CONOPS is intended to support and inform ICAO’s major framework documents, including the GANP, ASBUs, and the GATMOC.

2.6 Trajectory-Based Operations (TBO) are fully consistent with, and provide a principal pathway for realising, the integrated and globally interoperable ATM vision described in the GATMOC. Similarly, the CATS CONOPS recognizes that achieving this vision will require a common digital information ecosystem that enables seamless information sharing, greater interoperability and progressive operational evolution, while allowing States and Regions the flexibility to address their own operational priorities.

2.7 The global aviation community is already working collaboratively to advance. A notable example is the Multi-Regional TBO (MR TBO) Demonstration, a joint initiative involving Japan, Singapore, Thailand, the United States, Canada and Boeing. Experience gained through this initiative has reinforced that ICAO's System-Wide Information Management (SWIM) and Flight and Flow Information for a Collaborative Environment (FF-ICE) are foundational enablers for TBO and the broader transition towards information-centric ATM.

2.8 Consistent with the recommendations of the Fourteenth Air Navigation Conference (AN-Conf/14) regarding the transition to FF-ICE/R1 and the progressive evolution beyond the FPL2012 flight plan format after 2034, the coordinated implementation of SWIM and FF-ICE/R1 should remain a strategic regional priority. In this context, the Fourteenth Meeting of the Air Traffic Management Sub-Group (ATM/SG/14) of APANPIRG (Bangkok, Thailand, 3–7 August 2026) is expected to consider the endorsement of a regional FF-ICE/R1 Implementation Plan and the establishment of an APAC FF-ICE/R1 Implementation Task Force, providing a practical example of how global ICAO provisions can be translated into coordinated regional implementation.

2.9 The collaborative work of numerous stakeholders through the CATS Global Council, under the aegis of CANSO, has successfully arrived at a consensus of how ATM systems could evolve over the next 20 years. The CATS CONOPS is intended to complement and inform future ICAO global and regional planning activities, while remaining aligned with ICAO frameworks and regional plans. As a coordinated industry input to ICAO's efforts, the CATS CONOPS is intended to promote consistency and clarity, emphasizing the need for a cohesive pathway that integrates both traditional aviation and new entrants.

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to:

- a) note the information provided in this paper; and
- b) encourage APAC States, as appropriate, to use the CATS CONOPS as a complementary reference when developing or updating national and regional air navigation strategies and modernization plans, while ensuring alignment with ICAO provisions, the Global Air Navigation Plan (GANP) and relevant APANPIRG regional plans.

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