



ASSEMBLY — 42ND SESSION

TECHNICAL COMMISSION

Agenda Item 23: Global Aviation Safety and Air Navigation Plans

AIR TRAFFIC MANAGEMENT: A GLOBAL STRATEGIC IMPERATIVE FOR FUTURE AVIATION

(Presented by Civil Air Navigation Services Organization (CANSO), Singapore, United Arab Emirates, Airports Council International (ACI), International Business Aviation Council (IBAC), International Coordinating Council of Aerospace Industries Associations (ICCAIA), and International Federation of Air Traffic Safety Electronics Association (IFATSEA))

EXECUTIVE SUMMARY

The aviation industry is entering a pivotal era, one defined by transformation and innovation, as underscored by the ICAO Strategic Plan for 2026–2050. As aviation demand surges and the diversity of airspace users grows, air traffic management (ATM) must evolve to remain the enabler of safe, efficient, and sustainable global mobility. Unlocking the full potential of this future requires a forward-looking transformation; one that seamlessly integrates all airspace users while continuing to deliver societal value by connecting people and transporting goods safely and reliably across the globe.

This paper presents the Complete Air Traffic System (CATS) Concept of Operations (CONOPS)², developed by the CATS Global Council. It outlines an innovative vision and a transformative pathway for ATM. The CATS CONOPS offers a compelling opportunity to support the modernisation of ICAO's planning frameworks particularly the Global Air Navigation Plan (GANP).

Action: The Assembly is invited to request the ICAO Council to:

- invite ICAO to consider the industry-developed CATS CONOPS in future revisions to the Global Air Traffic Management Operational Concept (GATMOC), the evolution of the Global Air Navigation Plan (GANP) and other initiatives such as the ICAO Visions for advanced air mobility (AAM) and higher airspace operations (HAO);
- encourage ICAO and its Member States to prioritise investments and actions aligned with the foundational elements of future ATM, particularly the transformations associated with the advanced digital information sharing and infrastructure transformation as laid down in Phase 1 of the CATS CONOPS; and
- request ICAO to assess, and where appropriate, initiate and prioritize the strategic actions identified in the CATS CONOPS and highlighted in Section 2 of this working paper, particularly those aligned with ICAO's existing frameworks and priorities, while ensuring consistency with the Global Air Navigation Plan (GANP), State readiness, and regulatory considerations.

¹ English, Arabic, Chinese, French, Russian and Spanish versions provided by CANSO

² <https://www.futureskyvision.com/cats-conops>

<i>Strategic Goals:</i>	<p>This working paper relates to Strategic Goals:</p> <ul style="list-style-type: none"> • <i>Every Flight is Safe and Secure</i> • <i>Aviation is Environmentally Sustainable</i> • <i>Aviation Delivers Seamless, Accessible, and Reliable Mobility for All</i> • <i>No Country Left Behind</i> • <i>The Economic Development of Air Transport Assures the Delivery of Economic Prosperity and Societal Well-Being for All</i>
<i>Financial implications:</i>	To be determined
<i>References:</i>	<p>https://www.futureskyvision.com/cats-conops https://www.icao.int/about-icao/Council/Pages/strategic-plan-2026-2050.aspx ICAO Global Air Traffic Management Operational Concept (GATMOC), ICAO Global Air Navigation Plan (GANP)</p>

1. INTRODUCTION

1.1 Aviation is entering a new era. By 2045, air traffic is expected to more than double, and the growing diversity of airspace users, including drones, electric vertical take-off and landing (eVTOL) aircraft and space vehicles, will put unprecedented pressure on current air traffic management (ATM) systems. Enabling this future safely, sustainably, and efficiently requires a deep and strategic transformation of ATM.

1.2 ATM is not merely a technical function; it is a critical enabler of global aviation, ensuring safe and efficient operations across sovereign borders and among a diverse range of stakeholders. Today, it faces mounting pressures not only from the continued growth of conventional air traffic, but also from the need to integrate new entrants, adopt advanced technologies (including onboard systems) and contribute to global climate objectives.

1.3 Today's ATM systems are constrained by legacy infrastructure and fragmented governance. If left unaddressed, these limitations will become systemic barriers to growth, innovation, and sustainability.

1.4 Assembly Resolution A40-27: *Innovation in aviation* recognises the need to establish an inclusive strategic dialogue to foster greater collaboration and knowledge-sharing around innovation. ICAO's frameworks, including the Global Air Navigation Plan (GANP), provide essential global guidance for ATM modernisation. However, to remain effective in the face of rapid technological advancement and evolving operational needs, these frameworks must be revitalised with renewed ambition. The CATS CONOPS developed by over 80 organisations through the CATS Global Council represents a broad industry consensus and offers a valuable contribution to inform this evolution. Its integration should reinforce ICAO's existing planning structure, ensuring coherence and unity in the global transformation of ATM.

1.5 The CATS CONOPS supports key priorities identified in the ICAO Strategic Plan for 2026–2050, including the need for seamless, efficient, and resilient air navigation and flight operations that serve all types of aviation users.

1.6 During the 41st Session of the ICAO Assembly, the CATS Global Council's vision and roadmap were presented under Agenda Item 23 (WP/356). The Assembly acknowledged the CATS activities as a valuable industry contribution to the 2045 Future Sky Vision. The CATS Global Council has now completed the CATS Concept of Operations (CONOPS) for Future Skies, a detailed plan for the strategic transformation of ATM to enable the provision of seamless scalable integrated services.

2. A TRANSFORMATIONAL INDUSTRY VISION

2.1 The CATS CONOPS for Future Skies outlines a strategic pathway structured in three evolutionary phases:

- a) **Phase 1 – Digital Information Sharing and Infrastructure Transformation:** Establishes a real-time, connected airspace system through digital foundations such as trajectory-based operations, modular architectures, and shared information environments. This phase is urgent and investment-intensive but forms the foundation for all future capabilities.
- b) **Phase 2 – Advanced Automation and Performance Management:** Introduces advanced automation for safety-critical functions such as conflict detection, resolution, and trajectory optimisation and unlocks in-time system performance and safety management. This evolution will enable air traffic controllers to transition from tactical task execution to higher-value roles as strategic airspace managers.
- c) **Phase 3 – Seamless Airspace:** Envisions a unified, digital, and inclusive airspace in which all users, traditional and new, operate safely and harmoniously within an adaptive airspace. This will be achieved through dynamic separation, automated conflict detection and resolution, machine-to-machine coordination, and high levels of automation.

2.2 These phases are underpinned by strategic ambitions aligned with ICAO's goals, including safety, sustainability, scalability, flexibility, innovation, and interoperability.

2.3 The CATS CONOPS represents a broad industry consensus on the necessary transformation and evolution of current systems. As such it can serve as a catalyst for updating the GANP and other strategic initiatives, ensuring they appropriately reflect the shift toward digital, service-oriented, and AI-enabled operations in an integrated airspace.

2.4 The CATS CONOPS also proposes six Strategic Action Areas to support the broader transformation of global ATM through longer-term, cross-cutting efforts. ICAO is invited to consider advancing work in the following areas:

- a) **Strategic Action Area 1 - Securing the Economics of Change:** Encourage and support the development of innovative financing mechanisms by Member States and industry partners to accelerate early adoption and investment in future ATM infrastructure, including incentives for modernization, forward-fit strategies, and collaborative public-private funding models. ICAO is invited to provide guidance and act as a facilitator for such initiatives through coordination and knowledge-sharing.
- b) **Strategic Action Area 2 -Transforming Regulatory Frameworks for the Future:** Establish a global regulatory transformation programme, including performance-

based regulations and certification pathways for artificial intelligence (AI) and highly automated systems.

- c) Strategic Action Area 3 - Enabling New Airspace Service Delivery Models: Develop guidance for virtualised, modular, and cross-border ATM service provision, including regulatory frameworks for third-party and data service providers.
- d) Strategic Action Area 4 - Adapting the Role of Humans to Future Airspace Systems:
 - 1) Leverage research and innovation to develop a phased roadmap for the safe and adaptive integration of advanced automation, particularly AI applications, into ATM, supported by collaboration with industry and academia, and guided by continuous ethical oversight.
 - 2) Ensure that human roles evolve alongside technical advancements by building trust in automation, equipping professionals with new skills through comprehensive training, enhancing human-machine collaboration (including human-in-the-loop and human-on-the-loop concepts), fostering partnerships with labour organisations and other stakeholders, and implementing robust change management frameworks.
- e) Strategic Action Area 5 - Leveraging Research, Innovation and AI for System Change: Leverage research and innovation to develop a phased roadmap for the safe and adaptive integration of advanced automation, particularly AI applications into ATM, supported by academic collaboration and continuous ethical oversight.
- f) Strategic Action Area 6 - Embracing a Predictive, Real Time, Data-Driven Approach to Performance: Establish total system performance management (TSPM) frameworks that balance safety, efficiency, and environmental sustainability, enabling dynamic optimisation based on real-time data.

3. CONCLUSION

3.1 ATM is not only an enabler, but a strategic driver of the coming transformation of our airspace. A globally aligned and comprehensive transformation of ATM is essential to effectively support the profound changes expected in our skies. As this transformation unfolds, introducing greater complexity through mixed operations involving both legacy and innovative airspace users, it must remain grounded in aviation's foundational principle: safety.

3.2 The CATS CONOPS provides a valuable contribution to ICAO, serving as both a practical and visionary reference to revitalise its planning frameworks, accelerate system-wide modernisation, and unite global stakeholders around a shared future.

3.3 The Assembly is asked to consider the actions contained within the Executive Summary.

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