



WORKING PAPER

**SEVENTH WORLDWIDE AIR TRANSPORT CONFERENCE
(ATCONF/7)**

Montréal, HQ, 16 to 20 November 2026

Agenda Item 4: Emerging technologies, new business models and other associated aspects

4.3: Leveraging air transport data and the digital ecosystem for seamless, secure and resilient operations

**ENABLE AI-DRIVEN, INTEROPERABLE AVIATION DATA ECOSYSTEMS FOR
INFORMED POLICY AND DECISION-MAKING**

(Presented by the Secretary General)

EXECUTIVE SUMMARY

Rapid advancements in digitalization, aviation data ecosystems and artificial intelligence (AI) are transforming operational, regulatory and policy decision-making across international civil aviation. Despite these developments, fragmentation across data systems continues to limit interoperability, integration and effective use of aviation data.

This paper highlights the need to leverage on trusted, secure and interoperable aviation data ecosystems, aligned with ICAO provisions, to support risk-based oversight, enhance operational resilience, and enable evidence-based policymaking. It underscores the importance of harmonized, resilient digital infrastructure and responsible AI use to maximize the strategic value of aviation data.

Action: The conference is invited to:

- a) recognize the strategic role of aviation data and digital ecosystems as critical enablers of seamless, secure and resilient aviation operations;
- b) encourage States to align national aviation data, digitalization and interoperability initiatives with ICAO guidance and global frameworks;
- c) promote integrated, risk-informed and evidence-based policy and regulatory approaches supported by interoperable aviation data, advanced analytics and responsible use of artificial intelligence across the aviation sector; and
- d) encourage States to promote interoperable digital identity and passenger-data exchange frameworks, consistent with ICAO SARPs and guidance, to facilitate seamless travel, strengthen border security and support trusted global aviation data ecosystems.

Strategic Goal:

This working paper relates to Strategic Goal: *The Economic Development of Air Transport Assures the Delivery of Economic Prosperity and Societal Well-Being for All.*

Financial implications:

The activities referred to in this paper will be undertaken subject to the resources available in the 2026–2028 Regular Budget and/or from extra budgetary contributions, including the Voluntary Air Transport Fund.

References:

Doc 7300, *Convention on International Civil Aviation*
Annex 11 - *Air Traffic Services*
Annex 15 - *Aeronautical Information Services*
ICAO Cybersecurity Strategy, ICAO TRIP Strategy
Annex 9 – *Facilitation*

1. INTRODUCTION

1.1 Global air transport demand is projected to grow significantly, increasing system complexity and requiring enhanced coordination, interoperability and governance across the aviation system.

1.2 At the same time, digitalization, artificial intelligence (AI), cloud computing and advanced analytics are transforming operational and regulatory processes. Aviation data has consequently emerged as a strategic asset supporting operations, oversight and policymaking.

1.3 In an increasingly data-driven aviation environment, enhanced cooperation among States in the collection, management, sharing and use of air transport data is essential to support evidence-based decision-making, improve transparency, strengthen policy effectiveness, and facilitate the sustainable development of international air transport. Greater compatibility of data practices and methodologies, consistent with ICAO guidance and relevant global frameworks, can further support comparability, interoperability and informed policy development at the national, regional and global levels.

1.4 ICAO and its Member States generate and use diverse aviation data across safety, security, air navigation, economic and environmental domains. Ensuring the availability of reliable, timely and interoperable data is essential to support performance-based and risk-based approaches and strengthen system resilience.

1.5 While significant progress has been made, continued efforts toward the harmonization of data standards, formats and exchange mechanisms remain important to facilitate effective collaboration and fully realize the value of integrated analytics and AI-enabled decision-support tools.

2. DATA AND DIGITAL ECOSYSTEMS AS ENABLERS OF SEAMLESS, SAFE, SECURE AND RESILIENT AVIATION OPERATIONS

2.1 Data and digital ecosystems play a cross-cutting role across all aviation domains, supporting safety, security, operational efficiency, economic development and environmental sustainability.

2.2 The digital transformation of aviation has significantly expanded the generation and use of data, including operational surveillance, aeronautical information, meteorological data, environmental indicators and commercial datasets. Leveraging these diverse data sources supports advanced capabilities, including demand forecasting, disruption management, infrastructure planning and performance monitoring, thereby contributing to improved operational efficiency and informed decision-making.

2.3 Advanced analytics and AI further enhance situational awareness, operational coordination and evidence-based decision-making, contributing to operational continuity and system resilience.

2.4 The realization of these benefits requires effective data integration and sharing among stakeholders, including airlines, airports, air navigation service providers (ANSPs), regulators and international organizations. Alignment with ICAO's provisions in Standards and Recommended Practices (SARPs), ICAO's documents, and manuals is essential to ensure interoperability.

2.5 The development of trusted digital identity frameworks, including initiatives under the ICAO Traveller Identification Programme (TRIP) and Digital Travel Credential (DTC), can further support interoperability across stakeholders, facilitate seamless passenger processing and strengthen both security and facilitation outcomes through the secure exchange of trusted identity data.

2.6 Implementation of interoperable architectures based on internationally-agreed standards supports improved air traffic flow management, reduced delays and enhanced responsiveness to disruptions, including public health events, extreme weather and cybersecurity incidents.

3. POLICY AND REGULATORY FRAMEWORK FOR DIGITALIZATION, AI AND INTEROPERABLE AVIATION DATA

3.1 Effective use of digitalization, AI and interoperable aviation data requires coherent, trusted and forward-looking policy and regulatory frameworks that enable innovation while ensuring security, accountability, interoperability and alignment with international obligations.

3.2 In this context, ICAO's role as a global standard-setting body is essential to promoting harmonized approaches to aviation data governance, interoperability and digital transformation, and to avoiding fragmented national and regional frameworks.

3.3 Policies and regulations are necessary to ensure the protection of sensitive operational, commercial and personal data across the aviation data lifecycle, through clear governance of data access, exchange, use, validation, protection and retention, while supporting compliance, data quality, integrity and traceability.

3.4 In light of the increasing use of artificial intelligence and advanced analytics applied to passenger-related data, appropriate safeguards should be implemented to ensure the protection of privacy and personal data and avoidance of automated decision making without human engagement and oversight that may negatively impact passenger outcomes, consistent with the applicable national legislation and international frameworks. Common safeguards should be established and propagated where possible to enable trusted cross-border data exchange.

3.5 As aviation systems become increasingly interconnected through digital platforms, Application Programming Interfaces (APIs), cloud infrastructure and AI-enabled tools, resilient and secure digital infrastructure is critical to maintaining operational continuity and stakeholder confidence.

3.6 ICAO's recent AI survey and related analysis of results provide an important evidence base for identifying the practical needs, priorities and maturity levels of States in relation to the use of AI in aviation. The tasks carried out through this work can help ICAO better target its support to States. These activities may facilitate States' use of AI by informing the development of guidance material, capacity-building activities, knowledge-sharing mechanisms and harmonized approaches to governance, data readiness, oversight, safety assurance, cybersecurity and responsible AI adoption.

3.7 Harmonized standards for data formats, metadata and exchange mechanisms are necessary to enable scalable data ecosystems, reduce duplication and improve comparability across States. Thus, enhanced integration and interoperability, in line with ICAO's SARPs and guidance, will support the development of comprehensive aviation data ecosystems, strengthening policymaking, operational resilience and strategic planning.

4. GUIDANCE ON LEVERAGING ROBUST DATA TO STRENGTHEN OVERSIGHT, CYBERSECURITY, OPERATIONAL CONTINUITY AND EVIDENCE-BASED DECISION-MAKING.

4.1 Effective management of civil aviation is dependent on the availability and appropriate use of robust, reliable and high-quality data. As reflected in ICAO safety and performance management frameworks, effective oversight and decision-making require the use of consistent, measurable and verifiable data inputs supported by sound data governance principles, including data quality, integrity, timeliness and traceability.

4.2 In the context of regulatory oversight, data are essential for monitoring economic and operational performance, assessing compliance with regulatory requirements, and identifying trends, emerging risks and systemic vulnerabilities. Data-driven approaches support the implementation of risk-based and performance-based oversight, including the use of predictive analytics and early warning mechanisms.

4.3 The use of quantitative indicators—such as air connectivity metrics, operational efficiency indicators, and market competitiveness measures—enables a more transparent, objective, and evidence-based approach, aligned with performance-based and risk-based regulatory principles widely reflected in ICAO frameworks.

4.4 Regarding operational continuity, the experience of the COVID-19 pandemic highlighted opportunities to further strengthen coordination and data-sharing practices among sector stakeholders. In particular, the absence of sufficiently integrated systems and lack of timely data in some contexts posed challenges for timely decision-making and the implementation of coordinated measures. These lessons underscore the importance of advancing resilient and interoperable digital infrastructures capable of supporting effective crisis management and the timely execution of contingency measures across the aviation system.

4.5 The increasing importance of evidence-based policymaking is recognized as a guiding principle for sustainable sector development. The strategic use of data supports optimization of infrastructure investments, enhances public policy effectiveness, strengthens environmental monitoring efforts and promotes transparency, accountability and long-term sustainability in decision-making processes.

5. CONCLUSION

5.1 Robust, interoperable aviation data ecosystems are critical enablers of safe, secure, efficient, resilient, and sustainable international civil aviation, supporting increasing demand and operational complexity.

5.2 As aviation systems become more complex and interconnected, enhanced integration across operational, economic, safety, security, facilitation, and environmental data domains is required to support data-driven decision-making and the effective use of advanced analytics and artificial intelligence.

5.3 Such integration should align with ICAO's performance- and risk-based approaches to strengthen oversight, operational efficiency, and system-wide resilience.

5.4 Harmonized policy and regulatory frameworks, based on ICAO's SARPs and guidance material, remain essential to enable digitalization, interoperability, and innovation at the global level.

5.5 ICAO's role should be reinforced in promoting technical discussions and supporting States by providing strategic guidance on data governance and use, strengthening oversight, cybersecurity, operational continuity, and evidence-based policymaking.

— END —