International Civil Aviation Organization

A42-WP/406[1]
EX/178
27/07/25

WORKING PAPER

ASSEMBLY — 42ND SESSION

EXECUTIVE COMMITTEE

Agenda Item 18: Capacity Development and Implementation Support - Policy and Activities

USE OF ARTIFICIAL INTELLIGENCE IN AVIATION TRAINING

(Presented by Belize on behalf of Member States of COCESNA[2])

EXECUTIVE SUMMARY

The purpose of this working paper is to highlight the importance of incorporating tools and approaches based on Artificial Intelligence (AI) in training processes in the aviation sector.

Technological evolution and new operational demands make it imperative to modernize instructional design methods and training programmes, improving their effectiveness, personalization and efficiency through innovative solutions. This paper proposes that consideration be given to developing strategic and collaborative guidelines, incorporating best practices for the responsible and ethical use of AI in technical and operational instruction.

Action: The Assembly is invited to:

a) Note the potential of artificial intelligence for strengthening instruction design processes and aviation training programmes;
b) Encourage States and TRAINAIR PLUS Programme members to share experiences and best practices in the use of AI in training environments;
c) Request the ICAO Secretariat to consider developing a guide or technical document on the ethical, safe and effective use of artificial intelligence in the training of aviation personnel.

Strategic Goals:	This working paper relates to the Strategic Goals: *Every Flight is Safe and Secure* and *No Country Left Behind.*
Financial implications:	None
References:	ICAO Annex 1 — *Personnel Licensing* ICAO Doc 9941 — *Training Development Guide: Competency-based Training Methodology* TRAINAIR PLUS Programme Doc 10004 - *Global Aviation Safety Plan (GASP)*

[1] Spanish version provided by Belize.
[2] Belize, Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua.

1. INTRODUCTION

1.1 International civil aviation is undergoing an accelerated transformation process, driven by technological advances, new operational dynamics and the need to respond with greater agility to complex scenarios. In this context, the training of aviation personnel is one of the strategic pillars for maintaining and improving the safety, efficiency and sustainability of the global system.

1.2 ICAO's Global Air Navigation Plan (GANP) requires that the modernization of aviation infrastructure be accompanied by a parallel improvement in human capital management, including the evolution of teaching methods and training systems.

1.3 Over the past few years, ICAO has developed and strengthened various regulatory and methodological documents that provide guidelines for effective competency-based training, including Doc 9841 (Manual on the Approval of Training Organizations), Doc 10057 (Manual on Air Traffic Safety Electronics Personnel Competency-based Training and Assessment), Doc 9941 (Training Development Guide, Competency-based Training Methodology), and systematic instruction design principles. However, the integration of AI into these frameworks is still in its infancy and requires updated guidelines to enable its safe, ethical and standardized use.

1.4 In the area of instructional design, AI can contribute significant improvements through intelligent tutoring systems, predictive learning analytics, content personalization, automated feedback and adaptive simulations. These tools can complement and optimize traditional methods and real-world scenario-based approaches such as Cognitive Based Therapy / Evidence Based Therapy (CBT/EBT), enabling learning focused on individual performance.

1.5 Similarly, in the management of training provided by aviation training centres, especially those operating under the TRAINAIR PLUS Programme or recognized by civil aviation authorities, AI can strengthen curriculum planning, resource management, outcome monitoring and evidence-based decision-making. This facilitates the creation of more efficient, interoperable and sustainable learning environments.

1.6 The COVID-19 pandemic accelerated the adoption of digital technologies, revealing both opportunities and gaps in traditional training models. The current moment represents a strategic opportunity to move towards a hybrid training model, in which artificial intelligence technologies are harmoniously integrated with established ICAO standards, thus enhancing the quality and reach of training programmes to the benefit of all Member States.

2. CONTEXT

2.1 Up to now, efforts to develop and integrate AI into training processes for licensed civil aviation personnel have been isolated initiatives by training centres and have mostly focused on the development of teaching materials, which require significant financial resources.

3. OVERVIEW

3.1 In the face of current and future challenges in air transport, and in line with the objectives set out in the Global Aviation Safety Plan (GASP), the Global Air Navigation Plan (GANP) and the Global Aviation Security Plan (GASP), artificial intelligence is significantly transforming traditional teaching and learning models in various areas. In the field of civil aviation, this transformation is enabling greater

efficiency, flexibility and personalization of training processes, while at the same time creating an urgent need to review and update current regulatory and pedagogical frameworks.

3.2 In this context, it is crucial to analyse the strategic role that AI can play in modernizing instruction design and improving the management of training programmes. Such an analysis is especially important in aviation training centres that operate under schemes approved by the competent authorities and the ICAO TRAINAIR PLUS Programme, in which the responsible use of these technologies can translate into more effective, performance-focused training aligned with the demands of the current operating environment.

3.3 AI has the potential to strengthen training processes through learning personalization mechanisms, predictive performance analytics, intelligent simulations and automated feedback. It can also facilitate more efficient management of training, contributing to curriculum planning, resource allocation, progress monitoring and data-driven continuous improvement. However, the adoption of these technologies must be done responsibly, safely, ethically and transparently, so that their use is aligned with ICAO's strategic goals and with the principles established in regulatory documents.

3.4 In the face of this reality, it is considered essential for ICAO to formally recognize the strategic value of artificial intelligence in aviation training, not only as a technological trend but also as an enabling tool for addressing current and future challenges in the global aviation system. Accordingly, it is suggested that ICAO promote the analysis and dissemination of good practices by States and educational institutions that are already experimenting with the integration of AI in their educational processes. This initiative would make it possible to build a collective technical and pedagogical knowledge base to guide future decision-making.

3.5 In addition, the ICAO Secretariat should consider developing a guide or specialized technical document with a view to facilitating the ethical, safe and effective use of artificial intelligence in training programmes for aviation personnel. Such a document could complement existing manuals and provide clear criteria for the responsible use of these technologies, ensuring consonance between technological innovation, regulatory compliance and operational objectives.

4. CONCLUSION

4.1 The use of artificial intelligence in training processes for aviation personnel represents a strategic opportunity to enhance the quality, relevance and adaptability of training, in a global environment of increasing technological and operational complexity. Responsible use of AI will make it possible to strengthen both instructional design and the institutional management of training centres, contributing to a competency-based, evidence-based approach that strives for continuous improvement.

4.2 ICAO's leadership and technical support is needed to ensure a harmonious, safe and ethical transition. ICAO should acknowledge the potential of these tools and provide guidance on their use through clear guidelines based on existing regulations and the objectives of global plans. For its part, the Assembly is encouraged to consider measures that will promote the sharing of experiences among States and the development of common technical benchmarks, and that will foster a culture of educational innovation that will contribute to the safety and efficiency of international civil aviation.

— END —