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WORKING PAPER

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Agenda Item 8: Other business

CURRENT PRACTICES AND IMPROVEMENTS IN ARTIFICIAL INTELLIGENCE FOR CIVIL AVIATION

(Presented by the Central American Corporation for Air Navigation Services/COCESNA)

EXECUTIVE SUMMARY

Artificial intelligence (AI) offers a wide range of opportunities and benefits for civil aviation, transforming the way operations are managed and improving various aspects of the sector. AI can strengthen and optimise operational safety, increase efficiency in air navigation and data management, improve service quality, and provide advanced data analysis and accurate statistical predictions. With the advancement of technologies such as machine learning, computer vision, and automation, the industry faces key opportunities and challenges for their effective integration.

This working paper presents an analysis of the opportunities and benefits of AI in civil aviation, highlighting its positive impact on operations management, analyses current practices in the use of AI in aviation, and proposes key aspects for its improvement and future implementation. It proposes fundamental aspects, aligned with international regulations and strategies, with the aim of strengthening safety, efficiency and quality in the sector, harnessing the potential of AI to transform international civil aviation.

Action:	Actions suggested in section 6 of the study note.
Strategic Objectives:	• Safety • Air Navigation Capacity and Efficiency • Economic Development of Air Transport • Environmental Protection

1. Introduction

1.1 Artificial intelligence (AI) has become one of the most transformative technologies, revolutionising industries and redefining the way humans interact with machines. AI's ability to perform tasks that normally require human intelligence, such as problem solving, decision making, voice and image recognition, learning from data, and understanding natural language, is driving productivity and innovation.

1.2 Artificial intelligence has great potential to revolutionise civil aviation. Its integration into air traffic management (ATM), predictive maintenance and cybersecurity has led to significant improvements in operational efficiency, providing advanced tools to strengthen safety, efficiency and quality in operations management, as well as to perform data analysis and statistical predictions that improve decision-making, offering a wide range of opportunities and benefits. The implementation of AI enables more informed and rapid decision-making, optimising processes such as predictive maintenance, air traffic management and the passenger experience. AI's ability to process large volumes of data and learn from it facilitates the identification of patterns and trends, contributing to more efficient and safer management.

1.3 Furthermore, AI can improve operational safety by detecting anomalies and potential failures before they occur, enabling early intervention. Efficiency is increased through the automation of routine tasks and the optimisation of flight routes, reducing costs and operating times. Passenger service quality also benefits, as AI can personalise the travel experience and improve customer service.

1.4 ICAO, together with organisations such as IATA, EASA and FAA, has begun to develop guidelines to ensure the safe implementation of AI in aviation. However, a more robust framework is required to maximise its benefits and mitigate risks.

1.5 This note is developed in line with resolutions: A40-27 of the ICAO Assembly Innovation in Aviation (2019).

2. AI management at COCESNA

2.1 Currently, COCESNA has not incorporated the use of Artificial Intelligence components into its air navigation systems. However, recognising the impact and potential of this technology in optimising and ensuring the safety of aeronautical services, it has taken a significant step towards modernisation and efficiency by beginning to implement artificial intelligence (AI) in its operations. This effort includes the development of a regulatory framework governing AI management at the corporate level. The creation of this regulatory framework is essential to ensure that AI is used ethically and effectively, in line with international standards and industry best practices.

2.2 Establishing adequate risk management in the implementation of AI is crucial to ensuring the success and security of its operations. AI, while offering countless benefits, also carries potential risks that must be proactively managed. In addition, the integration of cybersecurity into the systems that provide air navigation services in the Central American region is essential to protect data and ensure business continuity. The creation of a Security Operations Centre (SOC) will strengthen the organisation's security posture through continuous monitoring, advanced threat analysis, and rapid incident response. In summary, proper risk management is essential to minimise the risks associated with AI and ensure that its benefits are maximised safely and efficiently.

2.3 An important component in the implementation of AI at COCESNA will focus on automation systems in Air Traffic Management (ATM) with the aim of optimising flight routes, predictions based on meteorological data and traffic patterns, as well as virtual assistants to support air traffic control.

3. Aspects to Consider for AI Implementation in International Civil Aviation

3.1 For international civil aviation, it is essential to define a regulatory framework governing the use of artificial intelligence (AI) in entities such as Civil Aviation Authorities (CAAs) and Air Navigation Service Providers (ANSPs). This framework should provide clear guidelines and standards to ensure the ethical and effective implementation of AI, aligning with international best practices and industry standards, considering cooperation between multiple entities and the integration of emerging technologies into the global aviation infrastructure. The creation of this framework is crucial to ensure operational safety, data protection, and business continuity at the international level.

3.2 For the implementation of artificial intelligence (AI), it is essential that technologies undergo a maturation process in several key areas, including (but not limited to): IT infrastructure, data management, big data, data mining and data analysis, business intelligence (BI), cloud computing, process automation, digital transformation, data governance and ethics, basic AI models, machine learning, and AI in business processes.

3.3 Strengthening staff skills is crucial for the proper implementation and use of artificial intelligence (AI) in process management. Continuous training and the development of specific AI skills enable staff to understand and make the most of emerging technologies, ensuring effective and secure implementation that enhances the use of these technologies in international civil aviation. This includes training in key areas such as data analysis, machine learning, cybersecurity and ethics in the use of AI.

3.4 Promoting and raising awareness about the proper use of artificial intelligence (AI) is essential to ensure that organisations can maximise its benefits while minimising the associated risks. The implementation of a regulatory framework governing the use of AI provides clear guidelines and standards that ensure the ethical and effective application of this technology. This framework should address issues such as data protection, transparency in AI processes, and accountability in automated decision-making.

3.5 Ensuring that artificial intelligence (AI) is managed under an appropriate regulatory framework is essential to guarantee its safe and effective implementation in international civil aviation. This framework must include compliance with cybersecurity and information security standards, thereby protecting critical systems and data from potential threats and vulnerabilities. The regulation of the information that feeds AI models is equally crucial, as the quality and accuracy of data directly impact the performance and reliability of AI systems. Furthermore, it is essential to protect sensitive or confidential data, ensuring that it is handled in accordance with privacy and data protection regulations. The implementation of robust cybersecurity measures and the adoption of international standards provide clear guidelines for protecting digital assets and ensuring data confidentiality.

3.6 Strategically leverage the massive volume of data generated by CNS (Communication, Navigation and Surveillance) systems through the implementation of advanced artificial intelligence (AI) and data analysis tools. This transformation of data into knowledge will enable the development of predictive capabilities, optimise operational and strategic decision-making, and improve airspace management efficiency.

4. Conclusions

4.1 Artificial intelligence (AI) has become one of the most transformative technologies, revolutionising industries and redefining the way humans interact with machines. In the field of civil aviation, it has great potential to transform operations management, providing advanced tools to strengthen safety, efficiency and quality.

4.2 For the effective implementation of AI in international civil aviation, it is essential to define a regulatory framework governing its use in entities such as Civil Aviation Authorities (CAAs) and Air Navigation Service Providers (ANSPs). This framework should provide clear guidelines and standards to ensure the ethical and effective implementation of AI, aligning with international best practices and industry standards.

4.3 The technology maturation process is essential to ensure successful AI implementation and management.

4.4 Promoting and raising awareness about the proper use of AI, as well as strengthening staff skills, is crucial for the proper implementation and use of AI in process management. Continuous training and the development of specific AI skills enable staff to understand and make the most of emerging technologies, ensuring effective and safe implementation. Furthermore, it is essential to foster a culture of innovation and continuous learning within civil aviation organisations.

4.5 AI management must be ensured under a regulatory framework that includes compliance with cybersecurity and information security standards, thus protecting critical systems and data against potential threats and vulnerabilities. The regulation of the information fed into AI models is equally crucial, as the quality and accuracy of data directly impact the performance and reliability of AI systems. Furthermore, it is essential to protect sensitive or confidential data, ensuring that it is handled in accordance with privacy and data protection regulations.

4.6 The implementation of AI in civil aviation must be approached from a multidisciplinary perspective, actively involving all NACC/WG/10 Working Groups. This comprehensive approach will enable the vast volume of data generated by CNS systems to be strategically leveraged, transforming that information into useful knowledge for operational and strategic decision-making. The application of advanced data analysis techniques, such as data mining and machine learning, will strengthen responsiveness, efficiency and operational safety in the region.

5. Recommendations

5.1 It is recommended that the proposal to regulate the implementation of AI in international civil aviation be submitted for consideration by the ICAO North American, Central American and Caribbean Working Group (NACC/WG/10), taking into account the following key elements:

- Define a regulatory framework to regulate the use of AI, providing clear guidelines and standards to ensure the ethical and effective implementation of AI.
- Respect the technology maturation process to ensure the success of AI.
- Strengthen staff competencies for the proper implementation and use of AI in process management. Continuous training and the development of specific AI skills enable staff to understand and make the most of emerging technologies.
- Ensure the management of AI under an appropriate regulatory framework that guarantees its safe and effective implementation in international civil aviation. This should include compliance with cybersecurity and information security standards, thus protecting critical systems and data from potential threats and vulnerabilities.
- Establish data governance mechanisms and ethical frameworks that ensure the quality, integrity and confidentiality of the information processed, in line with international best practices and ICAO principles.

5.2 It is recommended that the implementation of artificial intelligence (AI) be adopted with a multidisciplinary approach in all NACC/WG/10 Working Groups, promoting the cross-cutting integration of advanced analytical capabilities in different domains. In particular, it is suggested that the vast volume of data generated and stored by CNS systems be leveraged using data mining, machine learning, and predictive analytics techniques.

6. Suggested actions:

6.1 The following are invited to the Meeting:

a) Take note of the information provided in the Working Paper
b) that ICAO, within the framework of regional working groups as appropriate, contribute to States evaluating and strengthening their strategies for implementing artificial intelligence (AI) in civil aviation, adopting approaches based on international best practices, AI management regulations, staff competencies and cybersecurity in its application
c) that ICAO, within the framework of regional working groups as appropriate, define a regulatory framework governing the use of AI, providing clear guidelines and standards to ensure the ethical and effective implementation of AI
d) that ICAO, within the framework of regional working groups as appropriate, promote and support the strengthening of staff competencies for the proper implementation and use of AI in process management in order to take full advantage of emerging technologies.

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