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Item 7A
of the Agenda: Innovation

IMPLEMENTATION OF A DIGITAL CONTROL TOWER AT BAHÍA SOLANO AIRPORT AS A PILOT INITIATIVE FOR AIR TRAFFIC MODERNIZATION IN COLOMBIA

Working paper presented by Colombia, "*The Country of Beauty"*

SUMMARY

This working paper presents a pilot initiative for a digital control tower at Bahía Solano Airport, located on Colombia's Pacific coast, serving as a reference for the implementation of this technology. The objective is to standardize a regulatory and strategic framework that includes air traffic controller training and the evaluation of operational and environmental impact. The integration of digital towers, both on-site and remote, will improve efficiency and safety in low-traffic airports, aligning with ICAO standards and facilitating expansion in the region. Additionally, it will optimize air traffic management by reducing infrastructure and maintenance costs, providing greater flexibility to adapt to the future needs of the aviation system. This technology will enhance surveillance and risk detection, ensuring high levels of operational safety.

References:

- Eurocontrol: "Digital Tower Implementation and Best Practices," 2021. Describe las tecnologías y los proveedores clave en la gestión de torres digitales.
- NATS. (2021). London City is first major airport controlled by remote digital tower. NATS.
- Saab. (2013). Saab Remote Tower System in Norway Achieves Site Acceptance Testing Milestone. Saab Group.
- Saab. (2016). Saab's Remote Tower Wins Prestigious Award. Saab Group
- CANSO: "Remote and Digital Towers Guidance Material," 2023, segunda edición. Proporciona detalles sobre las tecnologías y mejores prácticas para la implementación de torres digitales y remotas en aeropuertos a nivel global
- Saab AB. (2021). Saab's technology makes London City Airport first major UK operator of remote air traffic control tower. Saab.
- CANSO. (2019). Brazil implements South America's first remote air traffic control tower with FREQUENTIS. CANSO.
- DFS Deutsche Flugsicherung. (2019). DFS Open Day MRTC Single Remote DFS. DFS Deutsche Flugsicherung.

- Frequentis. (2019). Brazil implements South America's first remote air traffic control tower with FREQUENTIS [PDF].	
ICAO Strategic Objectives	• *Every flight is safe (Safety and Security).* • *Aviation is environmentally sustainable.* • *Aviation provides seamless, accessible, and reliable mobility for all.* • *No country is left behind.*

1. Introduction

1.1 The modernization of air traffic management is a fundamental pillar for ensuring safety, efficiency, and sustainability in aviation. In this context, the implementation of digital control towers emerges as an innovative alternative that optimizes air traffic management, enhances operational surveillance, and provides greater flexibility to adapt to the future needs of the aviation system. These towers, which integrate advanced telecommunications, automation, and high-precision sensor technologies, represent an efficient solution for airports with limited access to air traffic control services, reducing infrastructure and maintenance costs.

Imagen 1.- Location Bahía Solano- Google Earth

1.2 Colombia, "The Country of Beauty," in alignment with ICAO's strategic objectives, presents this pilot initiative at Bahía Solano Airport, located on the country's Pacific coast, as a reference for implementing this technology in the regional context. The goal is to establish a regulatory and strategic framework that facilitates provider certification, standardizes aeronautical personnel training, and enables the evaluation of operational and environmental impact. The integration of digital towers, both on-site and remote, will contribute to optimizing air traffic at low-traffic airports, ensuring high levels of operational safety and improving connectivity in strategic regions.

Imagen 2.- Control Tower Remote

1.3 Beyond the benefits in efficiency and safety, implementing digital control towers also reflects a commitment to environmental sustainability. The reduction in physical infrastructure construction minimizes ecological impact, optimizes energy consumption, and promotes more efficient resource use. In this way, the project aligns with ICAO's global commitments to the sustainable development of aviation and the modernization of Colombia's air navigation system. Evaluating this pilot test will help consolidate a model adaptable to different operational environments, facilitating its expansion and contributing to strengthening the aviation sector in the region.

2. Discussion

2.1 The implementation of a digital control tower at Bahía Solano Airport, located on Colombia's Pacific coast near Panama, marks a milestone in the modernization of air traffic management in Colombia. This pilot initiative aims to demonstrate the feasibility and benefits of this technology in low-traffic airports, where resource optimization is crucial. By digitizing air traffic control services, operational efficiency is expected to improve, ensuring more precise surveillance and enabling more flexible traffic management, all with reduced infrastructure and maintenance costs.

2.2 One of the main challenges in implementing this digital tower lies in standardizing a regulatory framework in accordance with ICAO Annex 10 to support its operation. Air traffic controller training, the integration of new technologies, and the evaluation of operational and environmental impact are key aspects for its successful adoption. The experience gained in Bahía Solano will serve as a reference for the potential expansion of this model to other airports in the country, promoting a more efficient system adaptable to the future needs of the aviation sector.

2.3 Beyond operational benefits, this project will allow for the evaluation of the impact of digital towers in terms of safety and sustainability. The implementation of sensors and advanced monitoring systems will enhance risk detection and real-time decision-making, improving responsiveness to unexpected events. At the same time, the reduction of physical infrastructure will lower the environmental impact associated with the construction and operation of conventional towers, aligning with global trends toward more sustainable airport development.

3. Suggested Action

3.1 The Meeting is invited to:

a) The Meeting is invited to apply key strategies for implementing on-site digital control towers and remote digital control towers and to review the results of the pilot project, considering the points outlined in Appendix A of this working paper.

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APPENDIX A
IMPLEMENTATION OF A DIGITAL CONTROL TOWER AT BAHÍA SOLANO AIRPORT AS A PILOT INITIATIVE FOR AIR TRAFFIC MODERNIZATION IN COLOMBIA

a) Development and adoption of a regulatory framework: Establish regulations for the certification and operation of digital towers, ensuring their alignment with international standards and safety requirements.

Key Elements:

- Specific regulations for the certification and operation of digital control towers.
- Technical and operational guidelines aligned with international standards.

b) Training and education of aeronautical personnel (Operational and ATSEP): Develop training and simulation programs for air traffic controllers, facilitating their adaptation to digital tower operations through practical training.

Key Elements:

- Training programs for air traffic controllers in the use and management of digital towers.
- Specific training modules on automation and remote monitoring technologies.

c) Managing resistance to change: Implement awareness and participation strategies for personnel, highlighting operational benefits and ensuring a smooth transition.

Key Elements:

- Awareness campaigns on the benefits of digitization in air traffic control.
- Inclusion of air traffic controllers in the design and implementation phases to encourage adaptation and acceptance.
- Development of effective communication strategies highlighting the safety and reliability of the new technology.
- Gradual transition programs, combining traditional and digital operations until full adoption is achieved.

d) Evaluation of operational and environmental impact Analyze safety, efficiency, and sustainability indicators before and after implementation, optimizing processes and reducing environmental impact.

Key Elements:

- Studies on the efficiency and safety of the digital tower under real operational conditions.
- Reduction of environmental impact in terms of energy consumption and emissions.

e) Expansion and scalability of the project Define technical criteria to replicate the model in other airports, prioritizing those with similar needs and ensuring feasibility.

Key Elements:

- Identification of airports with similar characteristics where the on-site and remote digital control tower model can be replicated.
- Progressive implementation plan based on results obtained in Bahía Solano.

f) Integration of new technologies and resource optimization Incorporate artificial intelligence and advanced sensors to enhance surveillance, optimize infrastructure, and modernize communication systems.

Key Elements:

- Advanced monitoring and data analysis systems to improve air traffic management.
- Remote connectivity solutions that enable efficient control of low-traffic airports.

g) Implementation of a robust and redundant system Install systems with redundancy in communications, power sources, and servers, ensuring operational continuity and mitigating technical failures in air traffic management.

Key Elements:

- Implementation of alternative communication channels to prevent disruptions.
- Use of UPS systems and generators to ensure uninterrupted operation.
- Installation of servers in a redundant configuration to ensure data availability.
- Real-time monitoring of systems to proactively detect and correct failures.
- Contingency protocols, with established procedures to respond effectively to technical failures.

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