



WORKING PAPER

ASSEMBLY — 42ND SESSION

TECHNICAL COMMISSION

Agenda Item 24: Aviation Safety and Air Navigation Priority Initiatives

**DEVELOPING ICAO GUIDANCE ON THE USE OF ARTIFICIAL INTELLIGENCE FOR
AERODROME SAFETY MONITORING**

(Presented by Kazakhstan)

EXECUTIVE SUMMARY

This working paper proposes the development of ICAO guidance material to support the safe, standardized, and effective integration of artificial intelligence (AI) technologies into aerodrome safety monitoring systems. With emerging applications such as automated foreign object detection, runway surface condition analysis, and intelligent surveillance gaining traction globally, the absence of ICAO-level guidance poses challenges for harmonization and implementation.

Recognizing the potential of AI to enhance situational awareness, reduce human error, and support more responsive safety management, the paper calls for ICAO to initiate a structured approach to identify best practices and develop guidance tailored to aerodrome operations.

Action: The Assembly is invited to:

- a) note the growing role of artificial intelligence in enhancing aerodrome safety monitoring;
- b) encourage ICAO to initiate work on the development of guidance material on the use of AI technologies for safety monitoring of aerodrome infrastructure; and
- c) recommend collaboration with States, industry, and academic stakeholders to identify best practices, standard methodologies, and potential implementation models.

<i>Strategic Goals:</i>	This working paper relates to <i>Every Flight is Safe and Secure</i> .
<i>Financial implications:</i>	The financial impacts will depend on approved decisions.
<i>References:</i>	Annex 14 — <i>Aerodromes</i>

1. INTRODUCTION

1.1 The safety and efficiency of aerodrome operations rely heavily on timely detection and response to abnormal conditions, such as the presence of foreign object debris (FOD), surface deterioration, and unsafe aircraft or vehicle movements.

1.2 Traditional monitoring methods are predominantly manual, resource-intensive, and may be prone to delays or observational limitations, especially under low visibility or high traffic conditions.

1.3 The application of artificial intelligence in safety-critical functions—such as video analytics, pattern recognition, and real-time data processing—offers a transformative opportunity to improve the detection of hazards and enhance operational decision-making on the airside.

2. DISCUSSION

2.1 **AI use cases in safety monitoring:** AI-based systems can detect FOD using high-resolution video feeds and machine learning algorithms. They can also assess runway surface conditions through automated visual analysis and identify anomalies, such as unauthorized runway incursions or deteriorating markings, more rapidly than human observers.

2.2 **Surveillance and anomaly detection:** Intelligent video surveillance platforms can be trained to identify irregular activity, including unsafe proximity of vehicles to aircraft, wildlife incursions, and suspicious human behaviour. These systems operate continuously and can issue real-time alerts, enabling a faster response by airport operations teams.

2.3 **Integration with existing systems:** AI solutions can be integrated into existing airport operations control centers (AOCCs), advanced surface movement guidance and control system (A-SMGCS), or other digital platforms, complementing human surveillance and enhancing situational awareness.

2.4 **Standardization needs:** Despite growing implementation at certain airports, there is currently no ICAO guidance or framework that addresses the use of AI in aerodrome safety monitoring. Without standardization, States may face difficulties in evaluating such systems for compliance and ensuring consistent levels of safety across airports.

2.5 **Benefits and challenges:** Benefits include faster hazard detection, reduced reliance on manual inspections, improved data-driven reporting, and enhanced safety performance. Challenges include interoperability with legacy systems, initial cost of implementation, cybersecurity, and the need for staff training.

3. CONCLUSION

3.1 The application of AI in aerodrome safety monitoring presents a unique opportunity to modernize safety oversight and operational resilience. However, to fully realize its benefits, global guidance and standardization are essential.

3.2 ICAO is well-positioned to coordinate the development of appropriate guidance material, informed by stakeholder engagement and international best practices. This will support safe, secure, and harmonized adoption across aerodromes globally.