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WORKING PAPER

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ASSEMBLY — 42ND SESSION

EXECUTIVE COMMITTEE

Agenda Item 13: Aviation Security — Policy

RESEARCH ON AND APPLICATION OF ADVANCED TECHNOLOGICAL MEANS TO REDUCE THE IMPACT OF HUMAN FACTORS

(Presented by China)

EXECUTIVE SUMMARY

In recent years, China has conducted research on and application of AI technology for the automated detection of prohibited items from X-ray screening images and has achieved good results. Member States are recommended to enhance experience sharing in AI image recognition-related research and performance evaluation methods, jointly explore the applicability and deployment methods of AI in different application modes and scenarios, and further study the feasibility and development of AI recognition technology based on Open Architecture.

Action: The Assembly is invited to:

a) call on Member States to strengthen AI image recognition-related research and experience sharing, and jointly explore the scope of application and deployment methods of AI in different application modes and scenarios; and
b) call on Member States to respond to ICAO initiatives to encourage and promote the development and innovation of aviation security technology, and to actively promote and share relevant standards and testing methods, as well as application experience.

Strategic Goals:	This working paper relates to Strategic Goal of *Every Flight is Safe and Secure*.
Financial implications:	The activities referred to in the attached draft Assembly working paper will be undertaken subject to the resources available in the 2026 – 2028 Regular Budget and/or from extra-budgetary contributions as guided by the ICAO Business Plan 2026-2028.
References:	

[1] English and Chinese versions provided by China.

1. INTRODUCTION

1.1 Background

Security screeners play a pivotal role in aviation security, with their performance directly impacting operational effectiveness. Current airport screening practices face several common challenges: environmental distractions reducing screener focus, efficiency and vigilance; growing complexity of prohibited items, making it harder for detection, and thus increasing the risk of missed detection; mental fatigue from prolonged, repetitive tasks, impairing efficiency; and time pressure on X-ray interpreters to make decisions, escalating stress. These factors hinder the high-efficiency, high-accuracy demands of screening, making it difficult to keep pace with the rapidly expanding air transport industry. Ensuring consistent screening effectiveness and efficiency remains a critical priority among States.

With the rapid advancement of AI, deep learning - one of its key branches - has demonstrated immense potential in image recognition, especially for the critical field of security screening. Utilizing deep learning-based object detection algorithms to identify prohibited items from screening images has emerged as an effective approach to enhance efficiency and security effectiveness.

2. DISCUSSION

2.1 About the Technology

While AI applications in security screening were unfeasible merely a few years ago, significant breakthroughs have been achieved in recent years. AI can automatically perform repetitive, well-defined tasks while learning complex rules that were once exclusively human-domain. Through machine learning analysis of vast datasets of 2D/3D X-ray images, AI recognition algorithms can evaluate object shape, material composition, and density to autonomously flag potential prohibited items. These algorithms can perform comprehensive image analysis in an extremely short amount of time, avoiding efficiency degradation from human fatigue or lapses in concentration; maintain consistent, tireless operational performance without productivity fluctuations; possess continuous self-learning capabilities that enable rapid adaptation to evolving security threats and operational requirements. These advantages have empowered AI to play a critical role in reducing human error and enhancing screening performance, significantly improving efficiency and accuracy, and holding substantial potential for further optimizing screening processes.

2.2 Research and Application

Currently, some states have begun exploring the application of AI-powered image recognition technology to enhance screening efficiency and optimize processes. Some leading developed countries have already deployed X-ray CT screening equipment, with research focusing on leveraging AI algorithms to analyze and identify object features in 3D images generated by cabin baggage CT scanners, thereby augmenting screener capabilities in image interpretation. However, in many States, traditional dual-view X-ray remains the standard equipment for baggage screening. Therefore, key challenges include advancing AI-based recognition for 2D images, expanding AI applications across diverse operational scenarios, and elevating global civil aviation security standards collectively.

China has noted the initiatives regarding AI and APIDS discussed at ICAO AVSECP/36, and is actively exploring the integration of AI technology into security screening workflows. In recent years, through laboratory research and testing, as well as field pilots at 10 typical airports, China has assessed the

capabilities and effectiveness of AI image recognition algorithms, explored application scenarios and models for AI algorithms, and evaluated the impact of AI-driven image analysis on the overall efficiency and security performance. AI technology holds the potential to bring transformative improvements in screening operations. Currently, China is developing a comprehensive evaluation system for AI image recognition algorithms. Establishing fair and efficient methodologies for testing and evaluating AI algorithms, and accurately measuring their performance metrics are critical priorities for the practical deployment of AI in aviation security.

2.3 Recommendations

While AI technology holds significant potential, the detection performance and limitations of image recognition algorithms remains key barriers to intelligent workflow reform. Globally, AI algorithms are currently deployed in three primary operational models: Assisted Image Analysis (assisting operators in making decisions); Quality Control (conducting post-screening image review); and Automated Image Analysis (forwarding only AI-flagged images for operator review). It is recommended that Member States strengthen AI image recognition-related research and experience sharing, jointly explore ways to integrate AI technology and optimize screening processes and reduce human factor risks.

The Open Architecture (OA) for security screening systems has received wide attention from the industry once proposed. It is recommended to discuss the feasibility and future development of OA and explore more opportunities for international cooperation in it to find out whether OA-based AI image reading algorithms (i.e. third-party algorithms applied on security screening devices) have better performance compared with original AI algorithms.

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