60th CONFERENCE OF
DIRECTORS GENERAL OF CIVIL AVIATION
ASIA AND PACIFIC REGIONS

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AGENDA ITEM 5:   AVIATION SECURITY AND
                   FACILITATION

RESEARCH AND APPLICATION OF ADVANCED TECHNICAL
MEANS TO ENHANCE EFFECTIVENESS OF
SECURITY SCREENING

(Presented by the People's Republic of China)

SUMMARY

The pilot application of AI automated detection technology in identifying prohibited items from X-ray security screening images has demonstrated its potential to enhance screening effectiveness and efficiency while reducing screeners' workload. At present, China is establishing a testing and evaluation system for AI-based detection algorithms. In response to the ICAO initiative, China advocates for promoting and sharing standards and testing methods related to AI detection technologies.

RESEARCH AND APPLICATION OF ADVANCED TECHNICAL MEANS TO ENHANCE EFFECTIVENESS OF SECURITY SCREENING

1.   INTRODUCTION

1.1   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.

1.2   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   Recommendation

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) of security screening systems has garnered widespread attention within the industry. Compared to original manufacturer AI algorithms, whether AI image recognition algorithms based on OA (i.e. third-party algorithms deployed on screening equipment) demonstrate superior performance, it is recommended to discuss their feasibility, future development, and potential for international cooperation.

3.   ACTION BY THE CONFERENCE

3.1   The Conference 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.

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