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ENHANCING AVIATION SECURITY INSPECTOR COMPETENCY IN SECURITY EQUIPMENT: THE REPUBLIC OF KOREA'S EXPERIENCE & BEST PRACTICES

(Presented by the Republic of Korea)

EXECUTIVE SUMMARY

The Republic of Korea has implemented a comprehensive, tiered training program for aviation security inspectors to enhance their expertise in advanced security equipment like CTX, AIT, and AI systems. This initiative directly supports the Global Aviation Security Plan (GASeP) by bridging competency gaps in a rapidly evolving technological landscape. The curriculum, developed with Korea Testing Laboratory (KTL), ranges from basic equipment principles to advanced topics like IEDs and AI evaluation, providing a replicable best practice for global aviation security capacity building.

Strategic Goals:	This working paper relates to Strategic Goal of *Every Flight is Safe and Secure*
Financial implications:	Not applicable
References:	Doc 8973 — *Aviation Security Manual* Doc 10047 — *Aviation Security Oversight Manual* Doc 10118 — *Global Aviation Security Plan (GASeP)*

1. INTRODUCTION

1.1 The effectiveness of a State's aviation security oversight system is directly correlated with the competence of its aviation security oversight personnel, particularly its national security inspectors. This fundamental principle is enshrined within ICAO's framework, notably through the Universal Security Audit Programme Continuous Monitoring Approach (USAP-CMA), which emphasizes Critical Elements (CEs) vital for sustainable aviation security. Among these, CE-4 (Personnel qualifications and training) and CE-5 (Provision of technical guidance, tools and security-critical information) directly underscore the imperative for robust technical expertise among inspectors.

1.2 ICAO Doc 10047 explicitly states that effective State aviation security oversight necessitates "standardized procedures, equipment and infrastructures" and that inspectors must be provided with technical guidance on "acceptable types, operational specifications and performance capabilities" of security equipment. Furthermore, quality control activities are expected to include "maintenance and performance testing of security screening equipment".

1.3 The contemporary aviation security landscape is characterized by a dynamic threat environment and an accelerating integration of advanced technologies, including Information and Communication Technologies (ICT), into security equipment. This evolution necessitates a shift beyond the foundational understanding of conventional X-ray systems to a profound comprehension of sophisticated apparatus such as Computed Tomography (CT) X-ray scanners, Advanced Imaging Technology (AIT) based footwear screening devices, and Artificial Intelligence (AI) and Machine Learning (ML) driven threat detection systems.

1.4 These advanced technologies are revolutionizing passenger and baggage screening by enhancing accuracy and efficiency, streamlining operations, and improving threat prediction capabilities. Biometric technologies are streamlining identity verification and enabling contactless processes, while AI and ML are augmenting threat detection precision and facilitating predictive maintenance for equipment. The Internet of Things (IoT) and 5G networks are further bolstering real-time data transmission and processing, thereby enhancing airport surveillance and control capabilities.

1.5 Consequently, providing aviation security inspectors with timely and proactive specialized training in these cutting-edge security technologies is paramount for the efficient operation and sustainable management of national aviation security systems. This is directly aligned with the Second Edition Global Aviation Security Plan (GASeP)'s Global Priority Area 4: Improve technological resources and foster innovation. This information paper outlines the Republic of Korea's commendable initiatives in this critical domain.

2. REPUBLIC OF KOREA'S INITIATIVES TO ENHANCE AVIATION SECURITY INSPECTOR COMPETENCY IN SECURITY EQUIPMENT

2.1 The Republic of Korea has established a robust legal framework governing aviation security equipment and maintains comprehensive regulations for inspector training to ensure sustained competency. Nevertheless, the recent surge in sophisticated equipment, driven by the need to counter evolving threats and the adoption of ICT-infused security technologies (such as CTX and advanced footwear screening devices) by airport operators and air carriers, underscored the urgent need to enhance the oversight capabilities of national inspectors. Doc 10047 emphasizes that national regulations and programs should address requirements for "standardized procedures, equipment and infrastructures", and

Doc 9807 reiterates that the provision of technical guidance, tools, and security-critical information (CE-5) is crucial for inspectors to perform their functions effectively. Furthermore, quality control activities must include the "maintenance and performance testing of security screening equipment", indicating a clear need for inspectors to possess relevant technical expertise.

2.2 In response to this pressing need, the Republic of Korea has undertaken the following key initiatives:

a) Revision of Inspector Handbook: Prior to the ICAO USAP-CMA, the inspector handbook was updated to include a comprehensive checklist pertaining to aviation security equipment. This ensured that inspectors had clear and updated criteria for assessing advanced technologies in the field.

b) Development and Implementation of Specialized Training Curriculum: The Republic of Korea, in collaboration with the Aviation Security Equipment Testing Certification Center in the Korea Testing Laboratory (KTL), a leading institution in aviation security equipment performance evaluation, developed a comprehensive specialized training curriculum for aviation security inspectors. This curriculum, designed to meet the practical demands identified by inspectors themselves, commenced in September 2025. This initiative directly supports GASeP's Global Priority Area 5: Improve oversight and quality assurance by enhancing the standard of training and guidance on quality assurance.

2.3 This structured training program is tiered into three progressive levels (for detailed curriculum, please refer to Appendix A: Proposed Aviation Security Inspector Security Equipment Competency Enhancement Training Curriculum):

2.3.1 Basic Course (3 days / 18 hours): Designed for entry-level inspectors, this course aims to impart fundamental understanding of aviation security equipment concepts, principles, and an overview of performance inspection.

a) Core Content: Concepts of aviation security, aviation security threat cases, types and roles of aviation security equipment, and an introduction to the aviation security equipment performance certification system (legal basis, operational status, comparison with overseas certification schemes).

b) Equipment Fundamentals: Introduction to technology and key performance of passenger screening equipment (WTMD, HHMD, Body Scanners) and explosive detection equipment (ETD, BLS). Overview of operation principles and key performance of baggage screening equipment (X-ray, CT X-ray, EDS).

c) Practical Application: Hands-on practical sessions for performance inspection of passenger/explosive detection equipment and baggage screening equipment.

d) Special Lecture: Expert insights into domestic and international policy trends, technology, and market trends in aviation security equipment.

2.3.2 Professional Course (3 days / 18 hours): Designed for inspectors with up to 3 years of experience and successful completion of the Basic Course, this course focuses on practical performance inspection and understanding of performance certification processes.

a) Core Content: In-depth understanding of performance inspection and certification, and practical application of performance inspection checklists.

b) Advanced Equipment Theory: Comprehensive understanding of X-ray and CT X-ray technologies and their key performance indicators.

c) Practical Mastery: Hands-on practice sessions for operating X-ray and CT X-ray equipment, detailed analysis of performance inspection items and judgment criteria for X-ray, CT X-ray, passenger screening equipment (MD, Body Scanners), and explosive detection equipment (ETD, BLS).

d) Special Lecture: Case studies on aviation security equipment certification and testing/evaluation.

2.3.3 Advanced Course (5 days / 30 hours): This intensive course is tailored for selected inspectors with over 3 years of experience and successful completion of both Basic and Professional Courses. It aims to provide expert-level theoretical and practical knowledge in security equipment performance inspection and certification.

a) Core Content: In-depth analysis of international terrorism trends and aviation security incidents (including technological advancements in terror tactics), aligning with GASeP's Global Priority Area 1: Enhance risk awareness and response. Comparative analysis of domestic and international aviation security equipment performance certification standards, exploring differences in certification scope, test items, procedures, and discussions on international mutual recognition possibilities.

b) Deep Dive into Equipment Architecture: Passenger Screening Equipment: In-depth theory of metal detectors (WTMD, HHMD) detection principles, latest trends in advanced passenger screening technologies (millimetre-wave), major component configuration, and operational logic. Includes disassembly and structural understanding through group practical sessions.

c) Baggage Screening Equipment: Advanced understanding of X-ray (transmission, absorption, scattering) and CT X-ray key technologies. Principles of organic/inorganic material identification, 2D/3D image quality evaluation criteria, and Test-Kit utilization. Comprehensive analysis of X-ray generation devices, detectors, conveyor drive systems, roles of key components (X-ray tube, detector), malfunction causes, and self-diagnosis methods. Features disassembly-assembly practical sessions for structural mastery.

d) Explosives and IEDs: In-depth theory of explosive detection technologies including Ion Mobility Spectrometry (IMS) principles, Z-eff, and Density-based detection. Understanding of physical and chemical properties of explosives, differentiation between real and simulated explosives. Includes Improvised Explosive Device (IED) fabrication practical sessions (covering the four main components, HME detonators, and main explosive configurations).

e) AI in X-ray Systems: Fundamental understanding of AI interpretation algorithms, latest application cases, advantages/disadvantages of AI application, and security regulatory issues. Includes evaluation methodologies (detection rate, accuracy, false alarm rate metrics), test scenario development (standard simulants, concealment locations), and analysis of automated detection failures. Group activity presentations.

f) Lectures and Evaluation: Special lecture on aviation security inspector inspection case studies. Comprehensive theoretical and practical evaluation.

2.4 This robust training framework directly addresses the escalating technological complexity of aviation security equipment, thereby mitigating potential competency gaps among inspectors. It is designed to equip inspectors not only with the ability to verify regulatory compliance but also to technically evaluate equipment parameters, such as minimum detection settings, factors affecting performance degradation, and impacts of software updates. This empowers them to effectively oversee the operation and management of new technology-driven equipment deployed by aviation stakeholders, directly supporting the implementation of ICAO's CE-4 and CE-5 as outlined in Doc 9807 and Doc 10047.

2.5 The Republic of Korea is confident that this exemplary initiative resonates with a similar, growing demand for specialized aviation security equipment training among aviation security inspectors in other Contracting States worldwide. It is believed that inspectors globally recognize the critical need for enhanced technical education in this rapidly evolving field and would greatly benefit from such structured programs. Thus, the Republic of Korea's proactive approach and its detailed curriculum (encompassing training objectives, coursework, and duration) can serve as a valuable precedent. Furthermore, the Republic of Korea is actively exploring mechanisms to extend this training to aviation security inspectors in the Asia-Pacific region, demonstrating its commitment to contributing to regional aviation security capacity building, contingent upon the availability of necessary resources.

3. PIVOATL DRIVER FOR THE CONTINUOUS EVOLUTION OF THE GLOBAL SECURITY SYSTEM

3.1 The Assembly is invited to acknowledge and consider the experience of the Republic of Korea, with particular attention to the following points:

a) The enhancement of aviation security inspectors' expertise in security equipment is a pivotal driver for the continuous evolution of the global aviation security system. In the face of rapidly advancing technologies such as AI and CT scanning, inspectors' deep technical understanding and operational oversight capabilities are more crucial than ever, forming an indispensable component of ICAO's Critical Elements implementation. This directly supports GASeP's Global Priority Area 4: Improve technological resources and foster innovation and Global Priority Area 5: Improve oversight and quality assurance.

b) The Republic of Korea has proactively addressed this contemporary challenge by developing and implementing an innovative, tiered professional training curriculum for aviation security inspectors, in collaboration with the Korea Testing Laboratory (KTL). This program comprehensively covers fundamental equipment principles, advanced technologies, in-depth equipment disassembly practical, IED understanding, and AI-

based system evaluation methodologies, thereby substantively elevating inspectors' technical competencies.

c) The Republic of Korea's aviation security equipment training model represents a tangible and replicable best practice for the international community. Given the widespread recognition among other Contracting States of the imperative for such specialized training, the Republic of Korea's pioneering efforts and the detailed information concerning its curriculum will significantly contribute to global aviation security capacity building. Contracting States in the Asia-Pacific region and worldwide seeking to enhance their inspectorate's technical capabilities are encouraged to refer to the appended material for further guidance.

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APPENDIX

Proposed Aviation Security Inspector Security Equipment Competency Enhancement Training Curriculum

1. Security Equipment Competency Enhancement Training Program Structure

A. Basic Course

1. Duration (Hours): 3 days (18 hours)
2. Target Audience: Entry-level inspectors
3. Objectives: Understanding of aviation security equipment concepts and principles, understanding of aviation security equipment performance inspection

B. Professional Course

1. Duration (Hours): 3 days (18 hours)
2. Target Audience: Inspectors with less than 3 years of experience, Basic Course completion
3. Objectives: Practical aviation security equipment performance inspection, understanding of aviation security equipment performance certification

C. Advanced Course

1. Duration (Hours): 5 days (30 hours)
2. Target Audience: Inspectors with more than 3 years of experience, Basic + Professional Course completion
3. Objectives: Advanced theory and practical training in aviation security equipment performance inspection and certification

2. Course Curriculum (Proposed)

A. Basic Course Curriculum (Proposed)

1. Day 1 (6 hours): Aviation Security and Equipment (Concepts of aviation security, aviation security threat cases, types and roles of aviation security equipment), Introduction to Aviation Security Equipment Performance Certification System (Legal basis for aviation security equipment performance certification, status of performance certification system operation, certification systems in other fields and overseas).

2. Day 2 (6 hours): Understanding of screening equipment (1) (Introduction to passenger screening equipment (WTMD, HHMD, Body Scanners), technology and key performance of passenger screening equipment), Introduction to explosive detection equipment (ETD, BLS), technology and key performance. Understanding of screening equipment (2) (Baggage screening equipment (X-ray, CT X-ray, EDS), X-ray operation principles and key performance, CT X-ray operation principles and key performance, EDS technology and key performance). Field practical session (1) on screening equipment performance inspection (Performance inspection practical for metal detectors (WTMD, HHMD), Body Scanners, Explosive detection equipment (ETD, BLS).

3. Day 3 (6 hours): Field practical session (2) on screening equipment performance inspection (Performance inspection practical for X-ray, CT X-ray). Special lecture by aviation security

equipment expert (Domestic and international policy trends related to aviation security equipment, technology and market trends in aviation security equipment).

B. **Professional Course Curriculum (Proposed)**

1. Day 1 (6 hours): Understanding of aviation security equipment performance inspection and certification (Introduction to performance inspection/certification, performance inspection/certification criteria, performance inspection checklist). Baggage screening equipment (X-ray, CT X-ray) theory (Understanding of X-ray/CT X-ray technology and key performance).

2. Day 2 (6 hours): Practical exercise on baggage screening equipment (X-ray, CT X-ray) (Equipment operation practical for X-ray, CT X-ray, performance inspection items and judgment criteria for X-ray, CT X-ray, practical exercise for X-ray, CT X-ray performance inspection). Passenger screening equipment (MD, Body Scanners) theory and practical exercise (MD, Body Scanners performance inspection items, judgment criteria per item, practical exercise for MD, Body Scanners performance inspection). Explosive detection equipment (ETD, BLS) theory and practical exercise (ETD, BLS performance inspection items, ETD, BLS judgment criteria, practical exercise for ETD, BLS).

3. Day 3 (6 hours): Aviation security equipment certification cases (Aviation security equipment performance certification cases, aviation security equipment test and evaluation cases). Evaluation (Theory and oral examination).

C. **Advanced Course Curriculum (Proposed)**

1. Day 1 (6 hours): International Terrorism Trends and Aviation Security Incidents Special Lecture (Analysis of recent international aviation terrorism trends, major incident cases and factors of security failure, response to technological sophistication of terror tactics). Comparative Analysis of Domestic and International Aviation Security Equipment Performance Certification Standards (Comparison of domestic certification standards vs INTL' standards, differences in certification scope, test items, procedures, discussion on international mutual recognition possibilities).

2. Day 2 (6 hours): In-depth theory and equipment disassembly practical for passenger screening equipment (Detection principles of metal detectors (walk-through/handheld), latest trends in advanced passenger screening technology (millimetre-wave), major component configuration and operation logic, equipment disassembly and structural understanding (group practical)). In-depth theory of baggage screening equipment (X-ray (transmission, absorption, scattering, etc.) and CT X-ray key technologies, principles of organic/inorganic material identification, 2D/3D image quality evaluation criteria and Test-Kit). X-ray structure and principles, equipment disassembly practical (Analysis and understanding of X-ray generation device, detector, conveyor drive system, roles of key components (X-ray tube, detector, etc.), causes of malfunction and self-diagnosis methods, acquisition of equipment structure through disassembly-assembly practical).

3. Day 3 (6 hours): In-depth theory of explosive detection equipment (Ion Mobility Spectrometry (IMS) principles and detection technology, Z-eff and Density based detection technology). Understanding of physical and chemical properties of explosives (Physical properties of explosives, chemical properties of explosives, differences between actual explosives and simulated explosives). IED fabrication practical (4 main components of IED, HME detonator and main explosive composition, IED making (group activity)).

4. Day 4 (6 hours): Understanding AI X-ray and latest technology trends (Basic understanding of AI interpretation algorithms, latest application cases (e.g., INTL' AIRPORTS), advantages/disadvantages of AI application and security regulation issues). AI X-ray evaluation methods and cases (Concepts of detection rate/accuracy/false alarm rate metrics, test scenario configuration methods (standard simulants, concealment locations, etc.), analysis of automated detection failures). Group activity presentations.

5. Day 5 (6 hours): Special lecture on aviation security inspector inspection cases (Inspector assessment, inspection, unannounced assessment cases). Evaluation (Theory and practical evaluation).

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