



SECOND HIGH-LEVEL CONFERENCE ON AVIATION SECURITY (HLCAS/2)

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Agenda Item 3: Global Aviation Security Plan

**INNOVATIVE SOLUTIONS APPLIED FOR AUTOMATION OF X-RAY MACHINE
OPERATOR'S STATE AND PERFORMANCE MONITORING, AND ENHANCEMENT OF
THEIR JOB FUNCTIONS**

(Presented by the Russian Federation)

SUMMARY

This document contains information referring to proposals on the use of innovative solutions for computerised monitoring of X-ray operators' state and performance to improve human resources efficiency, reduce human factor aspect, and provide implementation of the task of PD 3.2 and 3.3 of the Roadmap for the implementation of the ICAO Global Aviation Security Plan.

Action by the High-level Conference on Aviation Security is in paragraph 4.

1. INTRODUCTION

1.1 Human factor is one of the key parameters affecting the security operators' efficiency and performance. Therefore, negligence in executing duties and labour misconduct compromise the security level of transportation facility. Security is a critical factor for present-day airports and it directly depends on the operators' performance of their duties. Monotonous work in shifts with brief activity periods has a major impact on security officers' attention, vigilance, and fatigue.

1.2 Loss of vigilance comes within 20-30 minutes after starting monotonous work. Attention shift, mobile phone distraction, chatting with a colleague, or sleeping while on duty are unfortunately widespread negative aspects of security operators' work. For instance, an X-ray machine operator may miss a component of an explosive device or any other prohibited article in the baggage.

1.3 Being guided by current issues encountered among X-ray system operators, an effective solution — OKO (checkpoint operator performance monitoring system) has been developed in the Russian Federation.

1.4 When creating OKO software solution, the Russian experts were guided by the following global objectives:

- a) Enhance the Aviation security officers' performance efficiency;

¹ English and Russian versions provided by the Russian Federation.

- b) Mitigate the risks associated with the loss of security operators' vigilance;
- c) Raise the capacity of checkpoints;
- d) Enhance the security of a transportation facility.

1.5 In order to identify the most efficient solution to monitor the operator's state, the developers have analysed the physiological evidence of human state and ways to obtain such evidence.

1.6 The camera installed on the X-ray machine operator screen records head position and gaze direction. Monitoring system processes the incoming video stream in online mode by analysing the officer's state and generates a relevant event response.

2. SYSTEM FUNCTIONALITY

2.1 Use of a camera as a solution to obtain data on the operator's state makes it possible to implement the following functions:

2.1.1 *Keep track of the operator's different states:* the system records gaze direction and position of the operator's head and generates a relevant event response.

2.1.2 *Add state profiles:* the functionality of OKO software solution makes it possible to create state profiles with different parameters and relevant event response in case of any deviations from target parameters.

2.1.3 *Integration with X-ray machine:* the operator monitoring system may be integrated with X-ray machine to optimise operating processes and enhance security at checkpoints. Thus, in case of a critical state (e.g. the operator falls asleep while on duty or sustained distraction from the screen) the X-RAY system's conveyor may be stopped to prevent any potential threat from penetrating the facility through the inspection point.

2.1.4 *Interaction with the operator:* if the operator deviates from parameters preset in the state profile, the system will generate an audio-visual signal displayed on the officer's workstation screen.

2.1.5 *Event logging:* the system makes it possible to generate progress reports both for a single operator or shift, or for the entire security personnel at the inspection point. The statistics obtained may be used for an objective evaluation of officers' performance, reliability of security checks, and therefore, evaluation of the facility vulnerability in general.

2.1.6 *Facial recognition and authentication of employees:* facial recognition option helps to restrict access to the system in order to prevent any unauthorised use and any of the following:

- employee authentication attempt on unassigned X-ray machine;
- employee entry on duty on the wrong shift; and
- unauthorised personnel operating the X-ray system.

2.1.7 *Operator shift management:* if the security officers are appointed to different inspection points at the operated facility, the system restricts access to X-ray machine in case the operator attempts to activate the X-ray machine on the wrong shift or unassigned inspection point.

2.1.8 *Work duration records*: the system is able to keep track of the continuous operation period and display a warning on operator's or shift supervisor's screen indicating that the operator has exceeded the number of hours prescribed by labour regulation.

2.1.9 *Creation of shift supervisor workstation*: it is possible to create a situation room to monitor the operators' current state, obtain camera image, and generate forced signals on the officer's screen.

2.1.10 *Scalability of existing functionality*: due to continuous system and software development, the system functionality may be expanded and adapted to specific features and range of issues of the operated facility.

3. **CONCLUSIONS**

3.1 OKO operator state monitoring system is a Russian-made unique product that helps to ensure unfailing monitoring of security officer's performance. The system makes it possible to enhance the quality and reliability of security checks by integrating multiple solutions in a single product, as well as security of the facility in general against penetration of actual and potential threats.

3.2 OKO operator monitoring systems ensure high safety of an aviation security facility, minimize the human factor aspect, and improve efficiency of inspection points by means of continuous monitoring of operators' state with the possibility to stop X-ray machine belt if the operator falls asleep or any other state occurs impeding the operator's performance.

4. **ACTION BY THE HIGH-LEVEL CONFERENCE**

4.1 The High-level Conference on Aviation Security is invited to:

- a) encourage the ICAO Secretariat Consider the significance of sharing best practices in this area between the States, including by means of AVSECPaedia;
- b) agree on the need to continue works in this area; and
- c) note the content of this working paper about the innovative technology used in Russian Federation in field of enhance the quality of pre-flight security checks and reduce the human factor.

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