WORKING PAPER

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ASSEMBLY — 35TH SESSION

EXECUTIVE COMMITTEE

Agenda Item 14: Aviation security
14.1: Developments since the 33rd Session of the Assembly

EQUIPMENT FOR THE DETECTION OF EXPLOSIVES USING THE NUCLEAR QUADRUPOLE RESONANCE METHOD

(Presented by the Russian Federation)

SUMMARY

This document presents information on the development of new explosives detection technologies in Russia which are a direct method of indicating the presence of explosives, and on the future practical implementation of these technologies.

Action by the Assembly is in paragraph 3.

REFERENCES

Report of AVSECP/15

1. INTRODUCTION

1.1 The spectral method of explosives detection based on nuclear quadrupole resonance (NQR) is one of several direct methods of detecting explosive objects based on the explosive charge present in them. The majority of explosives have in their composition ^{14}N atoms, the radii of which have a quadrupole moment. Among the multitude of chemical compounds there is no pair of substances whose NQR spectrum would be identical. Once the NQR signal is received on a set frequency, one can categorically speak of the presence of a given substance in the inspected object. The selectivity of this method is unique.

2. RESEARCH AND DEVELOPMENT

2.1 Over the last twenty years NQR spectrometry has been considered as one of the most promising methods of selective explosives detection in items inspected for detonation risk.

2.2 The work in Russia investigating ways in which to enhance the efficiency of recording the nuclear quadrupole resonance response signal based on optimal digital signal processing methods has been done rather intensively.

2.3 Based on the results of these studies, a prototype model of equipment for detecting explosives in passenger baggage was built in the last year. The equipment comprises an operating chamber with a volume of 144 litres (0.6 m X 0.4 m X 0.6 m) and is equipped with a conveyor for baggage handling.

Experiments were conducted using the equivalent of a 26 gram mass of hexogen with detection times of the order of 10 sec. The probability of correct detection was 96%, with a false alarm probability of 2%.

2.4 Given the results of the trials of the equipment to detect explosives in passenger baggage, a pilot unit, which has an operating chamber of 720 litres volume (0.6 m X 2.0 m X 0.6 m), was built to detect explosives under passengers' clothing.

2.5 Research is currently under way to create a floor unit to detect explosives packed in passengers' footwear that would make it possible to detect the explosives without having to resort to the procedure of having passengers remove their shoes.

3. ACTION BY THE ASSEMBLY

3.1 The Assembly is invited:

3.1.1 To note the information contained in this paper.

3.1.2 To take the requisite actions while considering that:

a) the designs of all the equipment types indicated do make it possible to operate it in an integrated technological passenger and baggage inspection chain; and

b) completion of the work on the experimental model of the passenger baggage explosives detector and the transition to its serial production for equipping Russian airports are expected in the very near future.

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