# BEST PRACTICES

**UDC 656.073.5**

**AFONIN Petr**
PhD, professor,
Academic International Futures
Research Academy
The Head of the Department of Customs
Technical Equipment of Saint-Petersburg
Branch of Russian Customs Academy

## TECHNOLOGY FOR SAFE OPERATION OF NON-INTRUSIVE CONTROL EQUIPMENT ADOPTED BY RUSSIAN FEDERAL CUSTOMS SERVICE

**Abstract**

The paper presents the development of legal, organizational, technical and informational methods of safe operation supplies of non-intrusive control equipment adopted by the Russian Federal Customs Service. The innovation educational technologies concerning virtual training workshop of X-Ray Cargo Vision Systems researched in Russian Customs Academy were overviewed.

**Key words:** X-Ray Cargo Vision Systems, customs non-intrusive control, virtual training workshop.

### Introduction

Customs Service of the Russian Federation is provided with more than 51 thousand technical equipments of customs examining of 250 various types. It allows customs services to fulfill their functions including smuggle of narcotics and explosives.

There are 471 stationary X-ray television systems to examine luggage, border crossings (checkpoints) are equipped with 49 mobile X-ray television systems. There are 113 devices to examine narcotics and explosives.

The analysis of efficiency of using customs technical equipments by customs services in 2009 (twenty oh nine) showed that 21551 customs infringements were revealed by means of technical equipment. It makes 42 % from total infringements revealed due to the application of special technical equipment.

Application of X-ray Caro vision systems is a great success in customs examining process and is a key point in revealing contraband goods. For protection of economic interests and safety of the Russian Federation there are 42 mobile and 12 fixed complexes for check of large-sized cargoes and vehicles in customs now. Till the end of 2010 (twenty ten) 6 fixed X-ray Cargo vision systems will be placed in different customs.

From January till August 2010 over 500 thousand customs examinations by means of X-ray Caro vision systems were held in Russian customs. More then 1500 administrative infringements and 21 criminal cases are results of using X-ray Caro vision systems. The sum of the imposed penalties has exceeded 24 million rubles. In 2009 it has been spent 692 thousand surveys (253 thousand in 2008). In 2009 692 thousands customs examinations were held, 121 criminal cases and 2665 administrative infringements were revealed. The Total sum of the penalties imposed in 2009 due to using x-ray television systems - 20.6 million rubles that almost has twice exceeded results of the previous year (11.1 million rubles).

Using X-ray Caro vision systems became a powerful technical instrument against narcotic smuggle. During last two years it has been withdrawn more than 1.5 (one and a half) tons of drugs. (733 and 804 kg accordingly), including 740 kg of confiscated heroin (415 kg in 2008 and 325 kg in 2009).

It should be noticed that X-Ray Cargo Vision System plays an important preventive role seriously complicating the organization of smuggles schemes of moving the goods and vehicles through customs border of the Russian Federation.

Technical equipments of customs examining used in the RF differ according to the field of application and exploiting conditions.

There are certain dangerous factors connected with X-ray Caro vision systems:

- ionizing radiation;
- Electromagnetic (not ionizing) radiations;
- high voltage;
- moving details of mechanisms and units;
- noise and vibration;
- Not authorized attempts of access to the confidential information ;
- the human factor.

To minimize negative influence of specified factors a technology of maintaining safety was developed in Russian Federal Customs Service. This technology includes organizational, technical, technological and legal measures.

**Problem statement**

The system of application of not intrusive means of customs control represents a vertical of the subordinated documents. The basic levels of this vertical are:

- level of federal laws;
- level of Governmental statements;
- level of Agency standard acts;
- level Legal acts of Russian Customs Service.

Standard legal documents regulate all factors of influence at all stages of life cycle of customs technical equipment – from designing to utilization.

According to the Federal law N 170-FZ of 11 November 1995 “On using nuclear energy” and The Federal Law N 3-FZ of 09 January 1996 “On national radiation safety“(article 10) activities connected with ionizing radiation sources are to be licensed. This process is regulated by The Governmental Order of the Russian Federation N 107 of 25 February 2004 “On statement of licensing activities closely connected with ionizing radiation”

Order of Federal service on customers' rights protection and human well-being surveillance N224 of 19 July 2007 “On statement of organization and making sanitary-and-epidemiologic, examinations, inspections, researches, tests and

toxicological, hygienic and other kinds of estimations". According to this order ionizing radiation sources and activities connected with them must have sanitary and epidemiological approval.

There are also other documents regulating radiation safety rules. They are represented on the slide.

- Sanitary Rules and Norms 2.6.1.1.2523-09 "Norms of radiating safety" ("NRB-99/2009")

Sanitary Rules and Norms 2.6.1.799-99 "Basic sanitary rules of maintenance of radiating safety" ("OSPORB-99")

- Sanitary Rules and Norms 2.6.1.2369-08 "Hygienic requirements on maintenance of radiating safety connected with X-ray CVS

It's allowed to use X-Ray Cargo Vision System only after sanitary-and-epidemiologic conclusion because it is a product representing potential danger to the person.

Customs authorities' activities before exploiting X-ray Cargo vision system:

- Getting licenses for activities closely connected with generating sources of ionizing radiation, getting necessary sanitary and epidemiological documents to confirm that working condition satisfy the requirements of sanitary rules.
- Assignment of personnel admitted to work with X-ray CVS, training courses and instructing for them. All the staff is included in special Group A personnel by order or, if necessary, in Group B personnel.
- Assignment of personnel responsible for radiation safety, for the account and storage of ionizing radiation sources.
- Developing and confirming radiation safety instructions for using X-ray CVS, instructions for personnel actions in emergencies.

Radiation control in zones of CVS consists of:

Control over doze capacity (scan dose) of brake radiation at the distance of 10 cm from external wall surfaces and protective gate of a building where fixed X-ray

CVS accelerator located, or on border of restricted access to mobile X-ray CVS at first exploiting, every time after repairment, but not less then once a year;

Control over dose rate of brake radiation at workplaces of the personnel (at commissioning and each time after carrying out of repair work, but not less often than 1 time a year);

Control over dose capacity in pencil of rays for mobile X-ray CVS (behind detectors), on border of restricted access zone (doing before the beginning of work);

Control of individual doze radiation of group A personnel (constantly).

Radiation Control Equipment should have certain characteristics, which are presented on the slide.

Individual dose control of external radiation for Group A personnel working with X-ray CVS is carried out by means of individual dosimeters, allowing to measure a dose of pulse photon radiation in a power range from 50 keV to 10 MeV. For example, TLD dosimeters on the basis of fluoric lithium.

Requirements to the personnel include the certain items (RF Federal Customs Service Order N 403 of 15 April 2008 "On confirming rules of labour protection in customs and institutions being in charge of Federal Customs Service in the Russian Federation"):

- The list of the personnel admitted to work with ionizing radiation sources should be approved.

- Personnel responsible for the account and storage of radiation sources should be assigned.

- Personnel responsible for the control over radiation safety should be confirmed.

- Customs officers no younger than 18 with no medical contra-indications are admitted to work with X-ray cargo vision systems.

- Before admitting to work with a radiation source customs officers should be properly educated, trained and tested on rules of safety and current instructions.

- Customs officers are tested on rules of safety before starting to work periodically, no less than once a year, and concerning management staff – no less than once in 3 years. Those who failed the test are not admitted to work with radiation sources.

- The admission to radiation sources is ruled by an order of Customs Authorities, after medical examination of the staff and after professional training courses.

Emergency situation at work with technical equipment:

– Damage of radiating protection system of equipment;

– Over radiation of personnel and others;

– Short circuit and damage of power supplies;

– Circuit of electricity through a human body;

– Mechanical breakage of installation elements;

– An emergency condition of a building damage in communication systems of water supply, water drain, heating and ventilation;

– Fire.

In such situations personnel must deal as it is stated in the Instruction

Information Protection System consists of:

– Technical equipment of protecting state secret information;

– Antivirus systems. Program product made in the Russian Federation – "Kaspersky Antivirus" is applied in Federal Customs Service of Russian Federation.

– Means of information protection against non-authorized access;

– Means of cryptographic information protection;

– System of Network safety;

– Control over information security (including maintenance of radio-electronic security of object). The main education center for training customs officers is the Russian Customs Academy.

Every branch of the Russian Customs Academy has a specialized Department of Technical Equipment of Customs Examining supplied with all necessary equipments.

Professional training of personnel working with X-ray CVS began in 2007. This educational process is a whole system consisting of two levels:

Education according to the program "Primary training for X-ray CVS operators" or "Training operators of fixed and mobile X-ray CVS-s to analyze images", 72-hour program

Representatives of equipment suppliers spend 80 hours on instructing personnel in customs departments before the first exploiting of X-ray CVS-s.

In above-mentioned educational process special software is used. This software was designed in the Russian Customs Academy together with organization "Rusbiteh".

It includes a subsystem modeling hardware complex of X-ray CVS and a system that imitates image analyzing station.

Due to modeling hardware complex the trainees are able to practice their skills in extension of mobile X-ray CVS. The trainees use special simulation equipments identical to original ones.

3D graphics and perfect audio effects provide simulation in virtual reality.

Due to imitation of image analyzing station trainees gain knowledge about main capabilities of X-ray CVS, get initial practical skills of working with interface elements, get theoretical information.

Character feature of the system is connected with a wide range of interfaces designed by such producers as Smiths Heiman, Rapiscan, Nuctech.

This system is supplied with practical skills generator capable to create special tasks including various tasks for education at the distance.

The represented system is only a part of up-to-date information technologies used in Russian Customs Academy. In addition to this, it is aimed to imitate customs clearance process and customs devices functioning, paying attention to macroeconomic factors; to manage educational process, including making schedules and electronic library.

**Research results**

At present the safe operation methods of non-intrusive control equipment adopted by Russian Federal Customs Service are considered as a system. This system is only a part of State system which included legal, organizational, technical and informational methods of safe using complicated dangerous (nuclear) objects. The Russian Customs Academy has developed new innovation informational virtual workshop for training staff of X-Ray Cargo Vision and Television Systems.

**Conclusions from the research**.

The results of present investigation represent the high level of safe application methods of X-Ray non-intrusive control equipment in Russian Federal Customs Service. The unique innovation educational technology (virtual workshop of X-Ray Cargo Vision Systems) developed in Russian Customs Academy can be used in traditional and distance learning technique for training staff of X-Ray Cargo Vision and Television systems all over the world.

**Bibliography**

1. Afonin P.N. The using of X-ray television systems. Saint-Petersburg. – Polytechnic University. – 2010. – 236 p.
2. Afonin P.N., Sakharova J.N. Adopted informational computational biotechnical technology in educational process of training staff of X-ray cargo vision systems. // Materials of conference “Customs control in the

South of Russia: history, theory, practice". Rostov-na-Dony. Rostov Branch of Russian Customs Academy. 2010. P. 115-118.

3. Afonin P.N., Gamidullaev S.N. Data Mining in Customs Risk Management. Saint-Petersburg. – Politechnical University. – 2010. – 243p.