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**IMPLEMENTATION OF CADETS PREPARATION FOR THE
SPECIAL AIRCRAFT AND AVIATION OBJECTS REVIEW DURING
INTERNATIONAL SPORT EVENTS (OLYMPICS, WORLD CUP) TO
ENSURE THE SAFETY OF PASSENGERS AND STAFF**

***Summary.** The criminogenic situation in the world in recent years is characterized as rather unstable, the number of explosions committed on passenger air transport, terrorist acts and acts of hooliganism ("football" and other hooligans) is constantly rising.*

In connection with this, the question arises about the introduction of measures for the effective counteraction to such types of crimes. One of such measures is the development and improvement of professional skills of the students for the organization and order of the inspection of passenger aircraft engaged in the transport of sports fans for the presence of explosive devices in them.

In addition, it is equally important to locate and dispose of additional explosive devices and explosive components of an explosive device that has already exploded at the site of the explosion.

This technology provides for a protocol of action during practical exercises of cadets for the inspection of aircraft and aircraft facilities in the event of a threat of an explosion and the procedure for carrying out special inspections of aircraft during tactical training, as well as during the study of special educational disciplines.

The purpose of conducting a special survey for cadets of aircraft and aviation objects is to: ensure the safety of sports fans and their personnel; detecting and disposing of threatened objects masked under the sport equipment or fan's attributes, possibly present in an aircraft, which may lead to an aviation event, as well as minimizing the consequences of such an event.

Key words: Flight safety, cadet training, higher education, practical component of the educational process, explosive objects.

Introduction. The number of crimes committed with the use of explosive devices during sporting events has sharply increased in the world. By definition (Motornyi I.D., 2015) "explosive devices – industrial, handicraft and homemade products of a single use, the construction of which provides for the creation of the damaging factors of work due to the use of energy explosion of explosives or explosive mixture".

Explosions in transport have become a widespread phenomenon. The intentions for the commission of criminal explosions are the most varied, and this may be the disruption of sporting events or terrorist acts aimed at destabilizing the situation in the state and "sowing panic" in society.

The most violent crimes committed using explosive devices are acts of terrorism committed during a large crowd of people.

According to the disposition of Art. 258 of the Criminal Code of Ukraine, a terrorist act, that is, the use of weapons, the commission of an explosion, arson or other acts that created a danger to human life or health or causing significant property damage or other grave consequences if such actions were committed in order to violate the public security, intimidation of the population, provocation of a military conflict, international complication, or in order to influence decision-making or committing or not committing acts by state authorities or local self-government bodies, official We are these bodies, associations of citizens, legal entities, or attracting public attention to certain political, religious or other views of the perpetrator (terrorist), as well as the threat of committing these actions for the same purpose – are subject to criminal liability.

In order to effectively counteract this kind of crime, in the majority of countries of the world special explosive units are created in the structure of the police and security services. These units are equipped with the necessary equipment, including mobile robotic remotely controlled complexes (MRRCC), which provide effective and safe conduct of necessary work on the destruction and destruction of explosive devices.

Results

The introduction of technology takes place during practical classes in special educational disciplines (Table 1).

Table 1. *Distribution of hours of study disciplines for 2018*

Name of the discipline	Total, (hours)	Lectures, (hours)	Seminar classes, (hours)	Practical training, (hours)	Individual work, (hours)
Forensic doctrine of traces of a criminal	90	6	10	20	54
Forensic weapons science	72	8	8	20	36
Judicial explosion examination	450	22	22	176	230

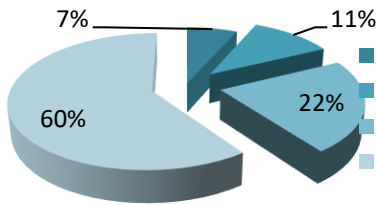


Fig. 1. Forensic doctrine of traces of a criminal

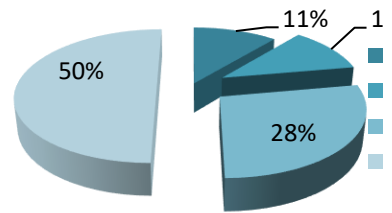


Fig. 2. Forensic weapons science

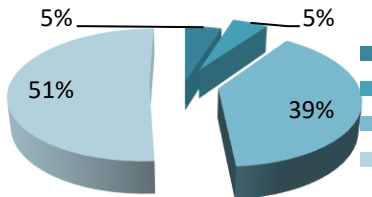


Fig. 3. Judicial explosion examination

An analysis of the practical activities of the relevant security services in Ukraine and similar units of other countries suggests that the use of passenger aircraft as objects for committing unlawful actions using explosive devices masked under the sports equipment or fan’s attributes can be carried out as a result of the emergence of conditions conducive to:

- 1) this mode of transport is distributed throughout the world, and is widely used by sports (football) fans;
- 2) it is convenient for criminals to implement visual control of the situation on the aircraft or outside it, in order to choose the most successful moment for the operation of the explosive device.

Algorithmization of actions of external visual inspection by cadets of an aircraft for tiers.

After the emergence of motivated suspicion, the senior group of students decides on the external review of the aircraft in the immediate vicinity to it. This review is recommended by a group of up to 4 specialists. Of these: 1 specialist - senior group, 3 specialists – review team.

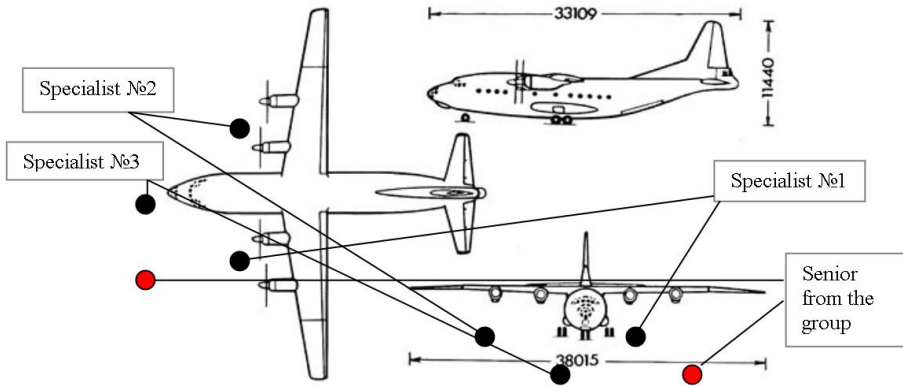


Fig. 4. The scheme of initial placement of specialists is as follows: the senior from the group of cadets – at the command post; specialist number 1 – near the front wheel of the aircraft under the fuselage at a distance of approximately 1 m; specialist number 2 – at the rear wheels on the right side of the plane at a distance of approximately 1 m; Specialist number 3 – at the rear wheels on the left side of the aircraft at a distance of about 1 m.

In this case, the senior from the group and specialists number 1, number 2 should be equipped with means of personal protection. In addition, specialists must have mirrors, video devices ("Telescope", "Vessel", etc.) or other devices for the inspection of hard-to-reach places in the design of the aircraft (bottom, chassis, technological hatches, etc.) and lanterns.

According to the team of the senior from the group, specialists number 1 and number 2, moving towards each other, begin simultaneous review of the design of the aircraft in the following tiers:

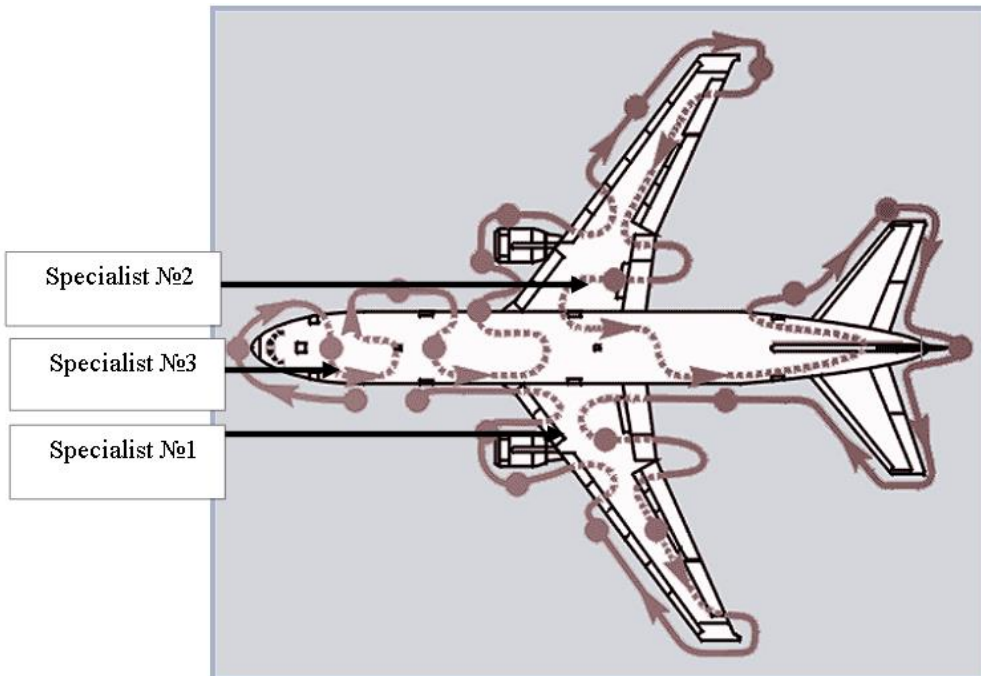


Fig. 5. Scheme of movement of specialists of explosives at an approximate review.

In this case, particular attention is drawn to: the presence of suspicious objects in the cavity of the front support chassis; the presence of suspicious objects disguised as a sports equipment or fan's attribute in luggage compartments; presence of suspicious items in air samplers; closing of the hoods of power plants; the presence of suspicious items in the abandoned space; the presence of suspicious items in the exhaust pipes of power plants; the presence of suspicious objects in the cavity of the niche of the right support of the chassis; closing technological hatches on the right side of the aircraft and the presence of suspicious objects; closing of the auxiliary power plant, the presence of suspicious objects; closure of technological hatches on the left side of the aircraft, the presence of suspicious objects; the closure of technological hatches of the caudal plume of the submarine, the presence of suspicious objects; the presence of suspicious objects in the cavity of the niche of the left support of the chassis; the presence of suspicious items in the air samplers of the air system of the PS; the presence of suspicious items in the compartments of removing waste from the substation, connecting the power supply; Each place after special care is marked with a chalk or a sticky tape and an appropriate entry is made to the operational information.

When checking technical hatches, compartments should pay attention to their closure and not violations seals and seals.

Internal review.

An internal review of an aircraft is carried out without passengers and aviation personnel, which is evacuated in advance to safe places, according to the relevant plans. This review is recommended by a group of up to 3 trainees with compulsory use of a search dog. The route of the movement of professionals is carried out - in parallel on either side or to meet each other, with the premises being inspected from the bottom to the top of the tiers.

An internal review of an aircraft consists of reviews of the following zones:

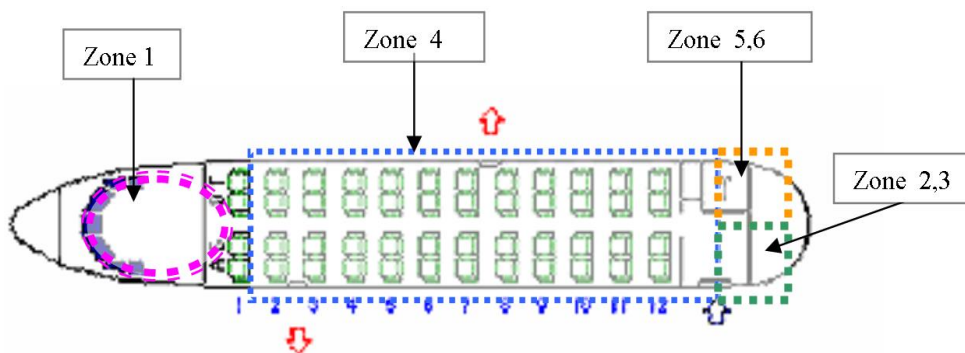


Fig. 6. Scheme of the internal arrangement of the premises of the aircraft.

Lobby and wardrobes (zones 2, 3).

Special lobby and cloakroom care is provided by cadets for the detection of explosive devices masked under a sports equipment or fan's attribute according to the list of places for flight survey (maintenance) of a certain type of aircraft.

Pilot cabin (zone 1): the entire floor of the cabin of the pilots, as well as the pedals of the steering wheel of the direction of the two pilots, the brakes and space behind the seats of the pilots;

– pilot cabin ceiling, side walls, rear wall of the cabin; storage compartments of oxygen equipment;

– a batch of storage of an on-board magazine, a manual on airplane flight operation and a list of actions in emergency cases; pilot seats, pockets of rear seatbacks, pillows and lower part of the seat; work places of navigator and flight mechanic; space outside the seats of the navigator and the flight engineer; wardrobe of the crew, place of storage of the luggage of the crew; place of storage of life-saving vests of the crew;

– the contents of the first-aid kit; places of fastening of fire extinguishers.

Passenger Salons (zone 4).

Special care for cadets of passenger cabinets is carried out for the purpose of detecting explosive devices masked under the sport equipment or fan's attributes in accordance with the list of places for the flight service of a given type of aircraft.

Toiletries and kitchens (zones 5, 6).

Special care of toilet rooms and kitchens is carried out by cadets according to the list of places for pre-flight inspection (care) of a certain type of aircraft.

Baggage review by cadets.

The inspection of the baggage is carried out after the first three stages, regardless of whether the explosive device disguised as a sports equipment or fan's attribute was discovered or not found. Baggage review is carried out gradually with the obligatory engagement of an official dog with the opening of each type of baggage.

Special survey of cadets of aviation objects.

A special survey of aeronautical objects is carried out without passengers and aviation personnel, which are evacuated in advance to safe places, according to the relevant plans:

– it is necessary to restrict the access of persons who are not involved in carrying out works at the facility;

– leave the room doors open for inspection;

– to divide the inspection zone and determine the sequence of its implementation (performed at 3 levels): 1) from the floor level to the human belt; 2) from the waist to the head; 3) from head to ceiling;

– carry out a survey in a consistent manner, after the survey, mark the areas and premises that were groomed;

– a special survey of the aircraft object is made taking into account the construction features and in accordance with the instruction;

– any information about the possible placement of an explosive device masked under a sports equipment or a fan's attribute on an aircraft object is considered to be reliable until it is detected or full confidence in the unreliability of the information received;

– in the case of obtaining non-specific or contradictory information, all aeronautical objects that may reasonably be considered to be in danger are subject to a special inspection;

– members of the group in case of detection of a suspect object disguised as a sports equipment or fan's attribute should act in accordance with the methodological recommendations.

Actions of cadets-specialists in the detection of explosive devices

In the case of the detection of explosive devices it is necessary to determine the consequences that may arise in the event of an explosion. To do this, you need to decide on: 1. Ability to tow an aircraft to a place of isolated (safe) parking. 2. Possibility of fusion of fuel (residue) from tanks of aircraft. 3. Moving an explosive device disguised as a sports equipment or fan's attribute to the place where it is disposed of. 4. Identify means of localization, destruction or disposal of an explosive device disguised as a sports equipment or fan's attribute.

Act strictly in accordance with the instructions.

Technical equipment used by cadets in search of explosive devices disguised as a sports equipment or fan's attribute

The minimum list of equipment required to survey an airplane for an explosive device includes: an explosion suit with a manipulator – 1 unit; bulletproof vest 4th – level 6 protection – 2-3 units; protective helmet level of protection is not lower than "Sphere" – for each specialist; radio interference generator – 1 unit; Steel stiff hook (preferably a tee) – 1-2 units; Strong non-elastic rope with a length of not less than 100 m – 3 units; strong 100-meter long rope with "cat" – 1 unit; screwdriver – 1 unit; mold ribbon (tape); inspection mirror – 2-3 units. or a set of viewing mirrors – 2-3 sets; flashlight - for each specialist; a card of hard paper or plastic in the size of approximately 10×5 cm – 2 units; Optical means of approaching an image (a binocular, a video camera, etc.); hydrogarma – 1 hour; electrodetonator – 2-3 units; detonating cord – 5-6 m; sapper wire – 100 m; blasting machine – 1 unit.

The most promising and safe use is the use of a special remote-controlled device (work) during the inspection of the aircraft, which must be equipped with appropriate equipment to look for and dispose of an explosive device disguised as a sports equipment or fan's attribute.

What do robotic systems need?

In the first place, in order to provide personal security guarantees to the personnel of the explosive units from unauthorized explosions during the execution of work to dispose of explosive items disguised as a sports equipment or fan's attribute.

Secondly, robotic complexes can remotely carry out operations for penetration into the premises, transportation of explosive items disguised as a sports equipment or a fan's attribute for safe distance.

Finally, the study of an explosive device disguised as a sports equipment or a fan's attribute before its destruction or destruction, in order to establish the structure and mechanism of commissioning.

To date, the leading countries manufacturing robot-technical systems for work with explosive devices are the United States of America, Great Britain, Germany, Canada, Japan and others. Works made in these countries consist of one or more

mobile robots, a set of variable work equipment, delivery facilities, power supply and maintenance.

Universal mobile works are small-sized remotely controlled self-propelled vehicles equipped with the necessary set of equipment and alternating working equipment. The vehicle consists of a chassis, a body and a power plant. The case can be made of aluminum alloys or alloyed steel. The running gear may be wheel, crawler, variable or combined.

The robot management complex includes: the information management part, the post of the mobile robot operator and a set of receiving and transmitting equipment that provides the transfer of information from the robot to the post of the operator and the teams that control the operator's post on the mobile robot.

Remote control of the machine can be carried out from the control station by cable at a distance of 100-150 meters, through the fiber optic communication line - at a distance of 300 meters, by radio - at a distance of up to 1000 meters. The choice of the communication channel option is determined depending on the operational environment and the type of equipment used. It is also possible to connect with works on Wi-Fi channels and Bluetooth.

When performing technological operations, the cadet operator, using information about the object and the progress of the work, obtained from cameras and displayed on the screens monitors, continuously manages manually by the executive mechanisms of the manipulator and vehicle.

In addition, the robot can be equipped with additional equipment that facilitates the conduct of individual operations:

- color television cameras with a controlled focus for detailed view of the object;
- stereoscopic television systems providing a three-dimensional image of the object;
- small-sized spotlights for illumination of an object under conditions of low illumination;
- laser targeting devices that provide an exact injection of a rifle or a hydro-destroyer to a given point of the object disguised as a sports equipment or fan's attribute.

The most commonly used devices used by cadets for explosive technicians are:

- Portable X-ray equipment for the investigation of suspicious objects for the purpose of detecting explosive devices masked under the sport equipment or fan's attributes;
- electronic stethoscopes for listening to the IP with the time-delayed mechanism of the delayed action;
- radio interference generators blocking the radio-controlled actuator of explosive devices disguised as a sports equipment or fan's attribute.

The main purpose of ultra light robots is to inspect hard-to-reach areas and details of objects (in tight spaces, in passages of aircraft vehicles, under the bottom of cars). The work of this type usually has a crawler chassis and is equipped with a lightweight manipulator, on which the camcorder and grip is mounted, or a light hydro

destroyer. The camera is installed on a turntable platform and with the help of a telescopic terminal the manipulator can rise to a height of 2 meters.

Very well, according to the authors, gave the definition of artificial intelligence, (Lauger George F., 2003) "Artificial intelligence can be defined as a branch of computer science, which is engaged in the automation of intelligent behavior".

In computer sciences, the problematic issues of artificial intelligence are studied from the point of view of designing expert systems and knowledge bases. Knowledge bases mean a set of data and output rules that allow logical conclusion and meaningful processing of information. In general, the study of artificial intelligence in computer science is aimed at the creation, development and operation of intelligent information systems.

To date, artificial intelligence and robotics are closely linked to one another. One of the important directions of artificial intelligence is the purposeful behavior of robots, the creation of intellectual robots capable of autonomously carrying out operations to fulfill the objectives of the goals set by man.

Operations that can perform work equipped with artificial intelligence is first of all: the definition of the system of the executive mechanism of actuating an explosive device (time, mobile phone, radio signal) with the subsequent blocking of the operation of the explosive device, using special equipment; in the presence of a gas analyzer, the type and type of explosives used; using portable X-ray installations, install a system for actuating an explosive device, provide possible variants for the disposal of an explosive device and determine the zone of possible damage.

Intellectual works, like machines-performers, take tasks in a general form and have the ability to make decisions or plan their actions in recognition of their uncertain complex environment. Thus, the time will be reduced to decide on further work with the detected explosive device disguised as a sports equipment or fan's attribute, in order to eliminate it or destroy it.

As for the modernization of the sabers' robots to equip their artificial intelligence, in our opinion, this is, in fact, having the practice and scientific achievements that exist in the world. However, it is necessary to start with a small, that is, to create a prototype robot-sapper that would meet those norms and requirements that exist in world practice, and then give them artificial intelligence.

Indeed, at present in Ukraine there are developments in robotics, which are used in various sectors of the national economy, including law enforcement agencies. However, these developments remained at the level of experimental designs that did not reach the serial production. But it is available in the form of questionnaires sampled at the National Academy of Internal Affairs and were used and applied to "Euro 2012".

For example, in Russia remotely controlled robots-sappers are serially produced by the Kovrovsky Electromechanical Plant, but Russian work on the external market is not supplied.

When purchasing robots-sappers of foreign firms, their cost is quite substantial in order to equip them with all the educational institutions that they need in Ukraine.

Conclusions. Summarizing the above, I would like to note that at present, there is an urgent need for the development of robot sappers in our state. We believe that if we combine the efforts of private security companies, interested business investors, research

institutions, practical experts of explosive engineering units, scientists of the National Academy of Sciences of Ukraine, it is possible to create a charitable foundation with the aim of financially supporting the development of this issue. As a result, the ability to develop its own competitive product with elements of artificial intelligence.

So, on the basis of the above, cadets, as future employees of the relevant security services, must constantly increase their professional competence, skill, and level of knowledge. To work out in the course of practical lessons receptions of search, discharge and disposal of explosive items disguised as a sports equipment or fan's attributes in aircraft and aviation facilities in crisis emergencies.

Particularly important element of obtaining the desired result is effective cooperation and interaction of specialists during carrying out of the specified measures of private security services, aviation security services, the Ministry of Internal Affairs of Ukraine, the Security Service of Ukraine and the Office of the State Protection.

The cadets should pay considerable attention to safety equipment while conducting work on the search and disposal of explosive devices masked under the sport equipment or fan's attributes, as the work of the aircraft requires special attention and carefulness of the actions of all cadets, such as future security officers and explosives workers, technical service.

Terms and abbreviations: **MTC DNDEKTS** of the Ministry of Internal Affairs of Ukraine – Explosive Technical Service of the State Scientific-Research Experimental Forensic Center of the Ministry of Internal Affairs of Ukraine; Internal Affairs of Ukraine – bodies of internal affairs of Ukraine; **IOG** – Investigative Operative Group; **ED** – explosive device; **RCED** – radio-controlled explosive device; **ES** – explosive substance; **EC** – explosive components; **AS** – aviation safety; **AUI** – an act of unlawful interference; **EAS** – engineering aviation service; **AC** – aircraft; **ASS** – aviation security service; **CA** – civil aviation.

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