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The role of digital technologies for the canine units involved in the law enforcement in European countries

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Pavel Polían *

Petr Polían **

Igor Kopotun ***

Abstract

The aim of the article was to consider the role of digital technologies in law enforcement by canine units in European countries. Comparison and observation methods were the main methodological tools. The research showed that European K9 units assist in rescue operations, detection of prohibited substances, firearms and ammunition. Their activity is necessary during the tracking and arrest of criminal suspects. European canine units are responsible for protecting service dogs from undue risk. It was found that tactile interfaces, UAV-based surveillance sensors, video surveillance systems and GPS are becoming components of European requirements for canine service activities. Projects implemented as part of the European research and innovation program Horizon 2020 aim to develop technologies for rapid response services. It is concluded that, the INGenIOuS Project resulted in the development of an effective K9 vest for a search dog, which is based on a complex of modern digital technologies. In addition, the installation of devices in patrol cars can help to save a working dog.

Keywords: situational awareness; companion dog; behavioural interaction; dog equipment; sensory interfaces.

* Rector, Akademie HUSPOL s.r.o., 68604, Kunovice, Czech Republic. ORCID ID: <https://orcid.org/0000-0002-3258-0340>

** Academic worker, Akademie HUSPOL s.r.o., 68604, Kunovice, Czech Republic. ORCID ID: <https://orcid.org/0000-0002-4009-0819>

*** Vice-rector, Akademie HUSPOL s.r.o., 68604, Kunovice, Czech Republic. ORCID ID: <https://orcid.org/0000-0002-2947-8599>

El papel de las tecnologías digitales para las unidades caninas implicadas en la aplicación de la ley en los países europeos

Resumen

El objetivo del artículo fue considerar el papel de las tecnologías digitales en la aplicación de la ley por parte de las unidades caninas en los países europeos. Los métodos de comparación y observación fueron las principales herramientas metodológicas. La investigación mostró que las unidades europeas K9 ayudan en operaciones de rescate, detección de sustancias prohibidas, armas de fuego y municiones. Su actividad es necesaria durante el seguimiento y arresto de sospechosos de delitos. Las unidades caninas europeas son responsables de proteger a los perros de servicio de riesgos indebidos. Se descubrió que las interfaces táctiles, los sensores de vigilancia basados en UAV, los sistemas de videovigilancia y el GPS se están convirtiendo en componentes de los requisitos europeos para las actividades de los servicios caninos. Los proyectos implementados como parte del programa europeo de investigación e innovación Horizonte 2020 tienen como objetivo el desarrollo de tecnologías para servicios de respuesta rápida. Se concluye que, el Proyecto INGenIOuS dio como resultado el desarrollo de un chaleco K9 eficaz para un perro de búsqueda, que se basa en un complejo de tecnologías digitales modernas. Además, la instalación de dispositivos en los patrulleros puede ayudar a salvar a un perro de trabajo.

Palabras clave: conciencia situacional; perro de compañía; interacción conductual; equipo para perros; interfaces sensoriales.

Introduction

Canine units are involved in search and rescue operations, assist during the collection of evidence, or during the apprehension of a criminal to contribute to a successful outcome in an optimal way. The goal of canine units in law enforcement is to achieve a proper arrangement of social relations in the field of use of dogs by authorized entities (Seliukov, 2020). This should be achieved both in official and everyday activities. This results in the provision of two directions: maintenance of proper conditions for the dog's life and effective use of all its abilities for the benefit of society and the state.

Dogs are intelligent animals that have an intrinsic value going beyond their contribution during service. This is reflected in changes to legislation and policy around the world (Chaney *et al.*, 2021). In case of working

dogs, the animal's condition largely reflects the interaction between three key components. These include individual dogs, human attitudes and behaviours, and the physical environment, including management practices (Cobb *et al.*, 2021).

The five areas of working dog welfare include nutrition, environment, physical health, behavioural interactions and their impact on the animal's mental state. They are a necessary current model for determining the general condition of animals (Mellor *et al.*, 2020).

Working dogs represent a small share of the population, but they can have a profound effect on human health and well-being (Van der Linden, 2021). These animals have become more in demand in the public service thanks to their special qualities. The use of dogs is especially necessary in the specific detection (search and rescue dogs, explosive detection dogs) and protection (military and police dogs).

However, even a well-trained dog with the most developed skills is unable to complete the tasks without outside help. Providing canine units with well-trained dogs will not lead to the desired result in the absence of qualified and professional canines (Shvets, 2020). Success in these roles requires dogs to meet complex behavioural criteria and undergo careful training, while the end result is not guaranteed (Bray *et al.*, 2021).

Many law enforcement agencies and the military use dogs for a dual purpose: protection and detection. The military trains single-purpose working dogs in reconnaissance, building searches, and the use of controlled aggression. Search and rescue dogs are trained to find alive people or human remains, and may be trained to respond at times of urban disasters or wilderness environments.

The use of special detector dogs is necessary to detect drug and contraband odours. Dogs also began to play an important role in the investigation of arsons, the search for computer and electronic materials (Petersen and Schoon, 2021). The search for currency, tobacco and help in the fight against poaching occupy a special place (Ricci *et al.*, 2021).

Digital technologies have grown exponentially, and their use has become global. The digitization has covered most of humanity. The technological revolution has combined with a change in the strategy of government organizations, which seek to be at the forefront of the use of digital technologies. The increase in the number of new sophisticated threats increases the need for the use of highly effective means during the work of canine units, for example, during the detection of explosives (Lazarowski *et al.*, 2020).

A high-tech solution becomes necessary to facilitate each step of this process (Vosinakis *et al.*, 2022) New innovative technologies may include

devices, automated vehicles, drones or server services. They become necessary to support canine services in the fulfilment of their tasks, ensuring the safety and efficiency of operations (Douklias *et al.*, 2021).

In view of the foregoing, the aim of the article is to consider the role of digital technologies in law enforcement by canine units in European countries. The aim involved the following research objectives:

1. summarize the main characteristics of the law enforcement agencies of European countries as the main subjects of canine support and to determine the forms and methods of organizing the work and training of special working dogs in the European countries;
2. identify the state of application of digital technologies in canine units of European countries for the purpose of possible implementation of relevant innovations for the maintenance of canine units of law enforcement agencies in Ukraine.

1. Literature review

The choice of the research topic is correlated with the modern vectors of the theoretical research in different states. The study conducted by Vosinakis *et al.* (2022) became the main tool and background for the article. The study focused on the analysis of search and rescue operations in terms of the use of digital technologies.

The work emphasized that the use of modern digital technologies for the companion dog of the K9 unit increases the unit's safety when working in the field, helps the K9 operator to better control the location and environment of K9. This results in an increased information volume provided to the command-and-control centre during the operation.

The work of Seliukov (2020) had an influence on the author's position regarding the subject under research. The author conducted a comprehensive analysis of the current legal framework of Ukraine, which determines the activities of canine agencies and services of different departments. Attention was paid to the problematic issues that arise during the everyday activities of canine units, the main gaps in the current legislation were identified, and attention was also focused on the resultant negative consequences.

The findings of Cobb *et al.* (2021) on the attitude of society towards the use of animals were taken into account in this research. The survey of studies on working dogs in relation to modern ethics, human interaction and five areas of animal welfare: nutrition, environment, behavioural interaction, physical health and mental state occupied a special place in the work.

In turn, Bray *et al.* (2021) explored best practices for evaluation, selection and improvement of working dogs, and concluded on necessary steps and recommendations for working dog organizations, breeders, trainers and researchers. Special attention should be paid to the findings of Foster *et al.* (2022) regarding research on the body-worn and airborne sensors to monitor working dogs and their environment during scent detection, as well as search and rescue operations. The paper by Douklias *et al.* (2021) regarding technologies that may include devices, automated vehicles and drones or server services required in rescue operations was of particular importance.

The studies of Ricci *et al.* (2021) and Lazarowski *et al.* (2020) used in the paper emphasize the role of recent advances in forensic odorology, a method that uses dogs to detect evidence at crime scenes, and the improvement and standardization of assessment technology to identify and improve behavioural characteristics of dogs.

The study of Shvets (2020), who emphasized the growing need of the law enforcement system for highly qualified canine handlers and service dogs, were used when shaping the author's position. The author made a detailed analysis of the problems of the modern stage of the development of service cynology and proposed ways of updating the administrative legislation in the field of canine support of law enforcement.

Bozkurt *et al.* (2014) analysed related technologies that can measure aspects of a dog's behaviour to assess temperament, predict training success, and even monitor health. The author outlines relevant vectors such as objectivity, subjectivity, implementation in practice and demonstrates the innovative technologies that have been developed for dogs, as well as new interactions that these technologies enable.

The active study of the issues selected in the article confirms that digital technologies in law enforcement by canine units deserve special attention and demonstrates the diversity of research in this field. Therefore, it is urgent to conduct the study according to new research criteria.

2. Methods

A set of practical and general methods of scientific knowledge was tested in the research, which was reflected in the consistently presented material of the article. Figure 1 illustrates the course of the research expressed in the step-by-step use of methodological tools for shaping the author's positions and drawing conclusions.

Observation was the main method of the research, which enabled identifying and confirming the latest innovative technologies tested by

canine units in Europe. This method was used to reveal the main problems that the government bodies of Ukraine encounter in the use of specialized dogs in professional activities; the peculiarities of new technological solutions in the studied field in Europe; practical aspects of training dogs to perform special tasks in the relevant units.

The observation method also made it possible to choose a vector of promising reforms in Ukraine in order to ensure a balance of approbation of positive European practices and taking into account national realities. The observation method was included in the experiment as its integral part, and its results were interpreted in the article with a view to the need for further research.

The main hypothesis of the study was the provision that certain methods of training dogs tested in Europe in the course of digitalization can be partially actualized in terms of the European integration of Ukraine, especially in the wartime.

Specific sociological and statistical methods of collecting and summarizing information were used to study materials for research on the effectiveness of canine units. These methods were the basis for the systematization of the practice of involving dogs by specialized divisions of government bodies.

The inductive method helped to generalize and present the main factors that make full adaptation of European innovative practices impossible in Ukraine. The synthesis method contributed to the formulation of new provisions, theoretical conclusions, proposals and practical recommendations in the field of effective interaction between a dog handler and a dog.

The method of comparative law was used to study the positive experience of European states, where specialized canine units are actively functioning as part of government bodies, in order to substantiate the appropriateness and further effectiveness of adapting positive foreign experience in Ukraine.

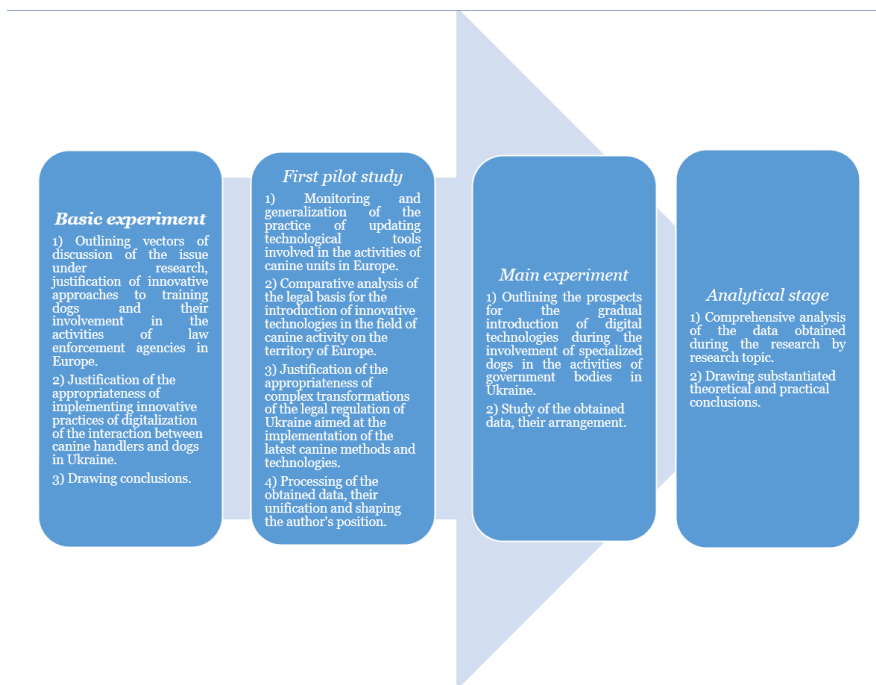


Figure 1: Research Design. Source: authors.

The method of interpretation of international and national legal acts in the field of regulation of methodologies and technologies of canine units was also used in the course of the research. The method of legal modelling was applied in the search for necessary and urgent legislative innovations in order to ensure the greatest compliance of national legal regulation with canine innovations, as well as with the latest trends in the European space and transformations of law enforcement agencies.

The reliability of the obtained results, the soundness of the conclusions and recommendations in law enforcement practice were confirmed by the study of a sufficient number of primary documents that constitute the information background for the identification of statistical regularities, the scientific understanding of the issue under research and modelling of the most optimal ways to solve it. The 47 surveyed references served as a stable background for building the author's conclusions and proposals in the area under research.

3. Results

Law enforcement is the main function of the canine service. Canine services are responsible for law enforcement, maintaining public order and ensuring public safety in their field. The functions of the relevant units include the performance of canine duties aimed at the preparation, training, maintenance and use of dogs during professional activities. The organizational function is also important, which implies the creation of proper conditions for the system of canine units or institutions. In European countries, canine units are interested in the well-trained service dogs and pay much attention to animal welfare.

The relevant activity is based on a five-factor model that includes nutrition, environment, health, behaviour and mental health. The mental health of the animal is studied in more detail through the application of this model. The result is the recognition that for every disturbed physical aspect there may be an accompanying emotion or subjective experience that may also affect well-being.

Dogs used for sniffing and scent detection are usually sporting breeds such as Labrador Retriever and Golden Retriever. Poodles and Jack Russell terriers are included in the list for their excellent sense of smell. German Shepherds, Dutch Shepherds, and Belgian Malinois top the list of tactical military dogs.

Malinois are especially ideal for tactics involving parachuting and abseiling. Breeding decisions can be based on generational information, giving organizations more control over the health and characteristics of their dogs. Dogs must not have physical problems such as hip dysplasia. Lameness is a common condition for early retirement in working dogs, sometimes reported in as many as 69% of cases.

The average cost of training a military dog, for example, ranges from \$20,000 to \$40,000. Training a dog to work as an explosive's detection expert can cost more than \$150,000. Dog training classes take place in several stages (Figure 2).

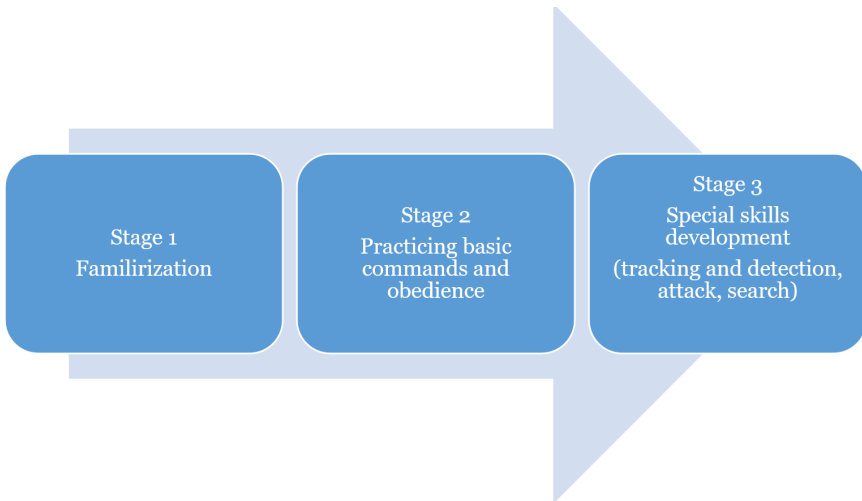


Figure 2: The Main Stages of Training Working Dogs (Grouped by the Author).

The obedience and familiarization stage involves a special emphasis on kindness and firmness, as well as immediate checking of the dog when it acts contrary to the command. In modern canine service dog training centres, no piece of equipment used in operations is ever used as an instrument of punishment (Council of Europe, 1987).

Tracking is used when pursuing and apprehending a suspect fleeing a crime scene. The trainer shall typically introduce the dog to a game of tug-of-war with a towel that does not have a scent to begin tracking/detection training. Later, the drug or weapon that the dog must detect is wrapped in the same towel so that it acquires the scent of the item. Trainers hide a towel with the smell of a drug or weapon wrapped in it so that the dog can search for it in different places and environments. Soon the dogs learn that when they smell these scents accurately, they start to play and this motivates them.

It is worth noting that a dog's nose has about 300 million olfactory receptors, compared to about 6 million in a human nose. So, the olfactory cortex occupies 12.5% of the total mass of the dog's brain, while it is barely 1% in the human brain. Search dogs are trained to distinguish more than 19,000 different scents for their work.

There are two ways to train working dogs to warn about the specialty scent. The first method is called "passive alert", which is common among explosive detection dogs. This mostly requires a non-aggressive reaction to

prevent detonation. This method implies that the dog sits next to a person when it smells the relevant scent. The method of “aggressive alert” is most common among dual-purpose police dogs, as the dog is trained to show signs by vigorously scratching and barking at an item having a scent of a particular substance.

Having learnt to track, the dog learns to act when meeting a suspect at the attack stage. If a man stops at the sight of a dog, the dog learns to keep him at a distance and bark until the handler arrives. But if a person runs, the dog will attack. The two most important things a dog learns when learning to attack are where to grab and when to let go. The dog is taught to grab the right hand or the hand holding the weapon and clamp it between the jaws until the handler arrives.

The dogs are then trained to attack under fire. At the fourth stage of the training cycle, the dog learns to search buildings, forests, factories and other objects that it may encounter during the work. Typical training scenarios might include detecting explosives in a convoy of 10 or more vehicles using decoys to create distracting stimuli. A special place is given to training in searching for victims under rubble.

There are many areas of specialization for working dogs (see Figure 3). In particular, detection dogs are used in crime prevention, rescue operations and investigation to identify and track the subject. These dogs are trained to distinguish scents by recognizing molecules scattered in the environment. Human scents are usually classified into primary, secondary, and tertiary categories. The main category of scents includes genetically determined compounds. Their relative concentrations remain constant over time regardless of environmental factors.

These factors include diet, weather conditions, air humidity, state of internals, emotional state, phases of the menstrual cycle, etc. The secondary category includes skin scents that depend on internal and external factors. Tertiary scents come from the environment (scents of the workplace, cosmetics, cigarette smoke, gasoline, scents of other people or pets). This method has also found important applications in the civil defence sector and in judicial investigations.

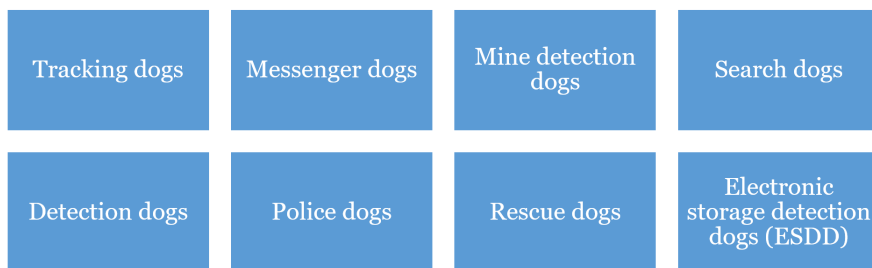


Figure 3. The Main Dog Training Specializations in Canine Units (Summarized by the Author).

A military guard dog is different from police patrol dogs, which are trained to protect a handler. Military guard dogs are trained to alert their handlers to the approach or presence of strangers and are used to guard supply depots, airports, military factories, bases and other important facilities. Scout dogs are trained to work in absolute silence to detect snipers, ambushes and other enemy forces nearby. Messenger dogs learn to work off-leash and must be equally loyal to two trainers. They must be motivated to leave one trainer to go to another, and vice versa, to transmit and deliver messages at a distance.

Messenger dogs are also trained to move silently and hide in their surroundings to keep themselves safe while following their routes. Mine detection dogs are trained to find tripwires, trap mines, as well as metal and non-metal mines. Explosive detection dogs are trained to alert when they detect the scent of relevant chemicals. Dogs are trained to respond to the following scents: nitrate and chlorate salts, HMTD, TATP, PETN, RDX (labelled and unlabelled), TNT, C4 (labelled and unlabelled), Semtex A&H, smokeless powder, black powder, dynamite and their derivatives. Some devices can only be detected by dogs because the explosives are contained in wooden or plastic boxes and the electric fuse is made of graphite.

Search dogs detect narcotic drugs and psychotropic substances, such as marijuana, hashish, cocaine, heroin, LSD, methamphetamine, ecstasy. Learning to find electronic equipment by scent is the least known specialization, which is highly in demand in dog training. Trained detection dogs can identify respiratory secretion samples from hospitalised and clinically diseased SARS-CoV-2 infected individuals.

Rescue dogs are trained to search for both alive people and dead bodies in obscure or hard-to-reach places. Cadaver dogs are commonly used in police operations in special units. Cadaver dogs can find whole bodies, decomposed bodies, and body remains (such as blood, tissue, hair, bones, and skeletal remains). Cadaver dogs can operate in water to find submerged bodies. They sit in front of the boat, scan the environment, and bark when they intercept target molecules on the water surface.

This limits the search area and makes the work of divers easier. Presence of the dog in the courtroom is a new direction in the training of working dogs. A police dog is trained to handle emotionally strained situations, such as cross-examination, where a rape victim comes face-to-face with the assailant. The dog does not leave the victim in court, allows itself to be stroked and hugged. This provides support in court for victims of crime, especially those who have suffered violence or sexual abuse.

Some military dog breeding organizations, such as the Swedish Armed Forces, have their own breeding programmes. Dog training centres are

based in Märsta and in Kungsgölen, north of Stockholm, as well as at the dog breeding station in Sollefteå. Between 35 and 40 litters of German Shepherds are born in the Sollefteå breeding unit every year (Swedish Armed Forces, 2022). In the Canine Training Department in Märsta, dogs are trained to patrol, search for ammunition, drugs and weapons for military units of the Armed Forces of Sweden. It is important to note that causing unnecessary suffering to a protected animal is an offence (Legislation.gov.uk, 2006).

This may include unnecessary suffering caused by inappropriate training methods. Electronic shock (static pulse) collars, digital anti-bark collars, electronic restraint systems are specific training devices that the Scottish Government does not approve. They may include any other methods of physical punishment or negative reinforcement. This includes using any device that injects oils such as citronella or other poisonous chemicals. They interfere with the dog's acute sense of smell, or emit any other aversive stimuli. Different countries also purchase working dogs from specialized breeders in Germany and the Netherlands.

Once assigned to a specific canine handler, each canine service dog lives with its partner in the unit. Only law enforcement officers who have undergone appropriate canine training in specialized educational institutions are allowed to work with working dogs. The youngest age of working dogs usually starts between 12 and 15 months of age, because that is when they are mature enough to concentrate effectively.

European K9 units are well trained and specialized in specific tasks. In those units' dogs outperform humans and machines in their ability to identify and track scents even in stressful and challenging situations. For example, in Sweden, the K9 staff includes 400 police officers and the same number of working dogs. Dogs are involved in 25,000 to 30,000 operations each year. Most police dogs in Sweden are German Shepherds and Malinois. More than 2,500 dogs work in different police departments in Great Britain; most of them are Belgian Malinois (Palmer, 2021).

In Southern Italy and the main islands, special K9 units are combined into helicopter police squadrons called Cacciatori (hunters) (Carabinieri, 2022). These units primarily operate in high-crime areas where the geography and topology provide a criminal organization with natural hideouts to store illegal weapons and explosives. Conceptually, this department is highly specialized, which combines military procedures and police techniques in a single operational vision.

The International Mine Action Standards (IMAS) are applied when using, for example, mine detection dogs in European countries (Geneva International Centre for Humanitarian Demining, 2022). IMAS 09.40 provides guidelines for using mine detection dogs (MDD). They are widely

used for scent detection, including applications related to the military, police, border control, health care, emergency response, and many others.

The standards 09.41 “Operational Procedures for Animal Detection, 09.44 “Guide to Occupational Health and General Dog Care” are also used. Dog handlers together with trained dogs assist Explosive Ordnance Disposal (EOD) and Improvised Explosive Device Disposal (IEDD) teams in EU countries.

The European Border and Coast Guard Agency (Frontex) promotes, coordinates and develops European border management. The Agency acts in accordance with the EU Charter of Fundamental Rights and the European integrated border management (IBM) (EUR-Lex, 2019). Frontex provides technical and operational assistance to member states through the development of standards (including in cynology).

An example of the expansion of the cooperation of the K9 units of Europe in the context of the fight against the consequences of armed conflicts is the implementation of the Support to Strengthening of the Canine (K9) Capacity of the Police Services to Detect and Confiscate SALW, Ammunition and Explosives Project (OSCE, 2022).

It also aims to increase the direct contribution of Kosovo K9 Police to the prevention, suppression and investigation of the misuse and illicit trafficking of small arms and light weapons, ammunition and explosives. According to the Project being implemented during 2020-2022, support will be provided to relevant institutions in fulfilling their obligations according to key performance indicators.

It is worth noting that new technologies using non-traditional materials, such as polymers, are increasingly being used in the production of small arms. Five K9 dogs were purchased for the police in 2020 under the United Nations Development Programme in Kosovo and the Support to Countering Illicit Arms Trafficking (CIAT) project in Kosovo, funded by the German government. They will be trained by certified K9 instructors and will be engaged in finding polymers (UNDP, 2020).

European law enforcement officers have begun training detection dogs to seize electronic equipment such as USB drives, micro-SIM cards, mobile phones, DVDs, CDs, external hard drives and memory cards. Specialist canine units in this sector are called electronic storage detection dogs (ESDD). ESDDs are taught to sniff out a chemical component, triphenylphosphine oxide (TPPO), which is common to most electronic gadgets. The ability to sniff out these electronic devices can be important in a variety of criminal cases, such as child pornography, financial crimes, terrorist activity, burglary, murder, and many others.

The National Police of the Netherlands and the police of Great Britain used dogs as detectors for hidden digital storage devices the most among European countries. Hertz, a German short-haired pointer, can be an example of the result of such work, who was trained to detect personal electronic devices while serving in the Royal Air Force Police. Since 2010, Hertz has detected more than 100 items of contraband in Afghanistan, including drugs and personal electronic devices that posed a serious threat to the lives of military personnel and civilians. In 2022, he was awarded the UK PDSA Dickin Medal in recognition of his service with the Royal Air Force in Afghanistan (Grierson, 2022).

The use of various digital technologies in K9 units, which require the appropriate equipment of the dog, is becoming very common in European countries. The collar is not always the best place for equipment. It is one of the strictest in terms of safety, space, weight and comfort. The weight of any attached device should be less than the recommended norm of 4-5% of body weight. It is important to make the device as small as possible and not to use the entire collar circle in order to increase comfort.

This will allow the dog to lie down without device's pressing down on the neck. The collar design means not only the weight minimization, but also the softest and most seamless surface near the neck. Unlike the collar, a harness provides much more space. Built-in sensor technology is also used as a new strap that fits into a dog vest.

Interest in the field of animal-computer interaction has led to research into computer technologies for communication between service dogs and their handlers. Tactile (sensory) interfaces in the form of vibrating motors are a promising approach to communication between the trainer and the dog. Tactile interfaces can provide a silent method of sending commands to a dog over long distances when voice or hand signals are inappropriate or impossible.

Dogs can successfully communicate tactile sensations by responding with a "message" by touching a target. Most modern electronic collars have a vibration function that can direct the dog to return to the handler without any verbal commands. The use of a UAV with cameras to monitor the dog from the air during the dog's performance of the task set by the dog trainer is also worth of attention. UAV-based sensors enable collecting data about the location of the dog within the environment and its interaction with specific objects.

The data are transmitted in real time. There is also an option when the dog is equipped with a video camera system on its head and a transmitter connected to a monitor at the dog handler's workplace. When the dog goes in search, the dog handler observes through the monitor what the dog sees at a distance of up to 10 kilometres. At the same time, the UAV overhead watches the dog, which works with a daytime or infrared camera.

The information is overlaid on a Google map, giving the team a unique view of the search, showing where the dog has been and areas that require further study. A discrete connection with the dog can also be built into the system, so the handler can send the dog commands such as “seek”, “lay down” and “return to the handler”. In addition, dogs can be equipped with a GPS-like tracking device that works inside buildings, tunnels, etc. As soon as a dog is sent to search, the track of that dog is then transmitted to the dog handler’s display.

Horizon 2020 — the European research and innovation programme — provides for establishing the connection between the cluster projects DRS-02 ASSISTANCE, CURSOR, FASTER, INTREPID, PathoCERT, RESPOND-A, RESPONDRONE, Search & Rescue, MED1stMR. They are funded under SU-DRS02-2018-2019-2020 theme — Technologies for First Responders — by sharing their concept and activities while creating synergies and planning future joint actions. For example, integrated Next Generation Integrated Toolkit (NGIT) for Collaborative Response is being continuously developed under the European project INGENIOUS (2022).

NGIT is used directly during response operations and increases the level of protection and operational capabilities of first responders. This ensures cooperation and coordination between team members, agencies, as well as between victims and infrastructure owners. This results in an increased situational awareness due to local and remote detection, monitoring and analysis of passive and active threats.

It also provides fail-safe data and voice communication between teams and victims. One of the objectives of INGENIOUS is to develop a set of special wearable technologies and miniature sensors. They are to protect and empower emergency responders and their K9 companions during response operations. A vest designed for a search dog involved in the work of a K9 unit can be an example.

The K9 vest provides the dog handler with the information about the dog’s well-being, location and working condition. It offers two video streams (HD and thermal) as well as bidirectional audio. Besides, it tracks the dog’s location using a high-precision GNSS receiver. Communication is provided through a connection to a local Wi-Fi network. Developers discussed the interfaces of the K9 vest in detail with K9 units. They concluded that ease of use, minimal overhead, and convenience would be most acceptable in this case.

The main switch is used to turn the K9 vest on and off, including the stabilizer and cameras. This button is located on a 3D printed box and is carefully designed to prevent accidental pressing. An LED battery level indicator is installed on the vest. The user interface includes a card to record the GPS coordinates of the dog’s location. Information is provided

almost in real time in the form of streaming video from cameras connected to the main processor.

The vest provides real-time tracking of the dog's position, thereby providing detailed information of the dog's detection with the help of visual confirmation through cameras. This enables the dog handler to remotely control the dog and communicate with detected victims via smartphone. Video and audio playback functions are not an integral part of field conditions. However, GPS location and field video are very useful for commanders in the operations centre, who can have near-real-time images of the situation in the field.

The K9 vest successfully passed the test in wet conditions (moving in shallow water and wet thorny thickets). The dog handler can use the two-way speaker to give commands to the dog, to communicate with found victims, to listen to the dog's barking over the loud sounds of the rescue operation.

The use of digital technologies in the work of canine units of European countries can save the life of a service dog. The K9 officers often leave dogs in patrol cars during routine police operations. This can cause a dog overheating situation, which can lead to the death of the animal. As a result, patrol cars are equipped with innovative devices such as Hot-N-Pop Pro and K9 Heat Alarm Pro (AceK9.com, 2022), which track information about the temperature inside the car.

In case of high temperatures, a notification from the thermal alarm is sent directly to the dog handler's smartphone, tablet or PC with the internet browser. After the alarm is triggered, the window automatically opens and the fans or air conditioners turn on. Besides, the driver can remotely open the door to allow the dog to leave the vehicle.

The involvement of dogs in the work of law enforcement and other government agencies is also being actively implemented in Ukraine (Figure 4).



Figure 4: Subjects of Canine Support in Ukraine. Source: authors.

For example, the use of canine teams in the State Customs Service of Ukraine is regulated by law (Legislation of Ukraine, 2021b), a canine unit is established in the State Border Service of Ukraine (Legislation of Ukraine, 2018b), and the canine units of the State Emergency Service (Legislation of Ukraine, 2018a), the National Guard of Ukraine (Legislation of Ukraine, 2014) and the National Police of Ukraine (Legislation of Ukraine, 2016).

In 2017, the 2020 Concept of Development of Canine Services was approved in Ukraine (Legislation of Ukraine, 2017). One of the tasks of the Concept was to create an effective system of material and technical support for updating the existing resources of canine units and providing them with modern means of training, maintenance and use of service dogs.

Canine agencies can be established as departments, centres, units, services, groups and divisions. For example, the State Customs Service of Ukraine had 109 canine teams as of December 31, 2020. According to the specialization types, 67 canine teams are trained to search for narcotic drugs and psychotropic substances, 13 canine teams – to search for weapons, parts for weapons and ammunition, 17 – to search for tobacco products, 1 canine team to search for paper money, as well as 20 canine teams with dual specialization (State Customs Service of Ukraine, 2021). In 2021, the canine teams detected 616 items and substances prohibited for movement across the customs border of Ukraine.

In 2021, the canine units of the State Emergency Service of Ukraine were involved 71 times in the search for victims in forest (mountainous) areas and in the destroyed buildings, having saved the lives of 18 people (State Service of Ukraine for Emergency Situations, 2021). According to the results of the annual certification for determining the level of training of canine teams, 40 search and rescue dogs and 7 mine detection dogs of the State Emergency Service were certified and allowed to perform their assigned tasks.

Work has begun on the implementation of departmental digital radio communication in the system of the State Emergency Service. The departmental digital radio communication system has been partially deployed in the Donetsk and Luhansk regions with the international technical assistance from the UN Development Programme in Ukraine; in Chernivtsi and Ivano-Frankivsk regions — due to the Cross-border Cooperation Development Programme. By the way, Patron the dog from the Chernihiv canine unit of the State Emergency Service, whose specialization includes explosive detection, became a kind of symbol in Ukraine during the armed aggression of the Russian Federation.

In May, he received the state Award for Dedicated Service presented to him by the President of Ukraine V. Zelenskyi (Pavliuk, 2022). Patron the dog detected more than 300 explosive devices. The Ukrainian Kennel Union presented Patron the Four-Legged Defender Award in September 2022.

The standards in canine science developed by Frontex together with EU countries are being implemented in Ukraine with due regard to the national legislation). The International Mine Action Standards (IMAS) are used in the practical activities of the canine units of the Armed Forces of Ukraine. Canine units of Ukraine face a number of problems. These include the lack of comprehensive legislative regulation in this area, a heavy burden on the dog handler and the dog.

There is a lack of a sufficient number of institutions in the country for the effective training of dog handlers, as well as an understaffed canine unit in different bodies and services. A positive step in this area was the development and implementation of the State Standard for the training of dog handlers (code 6129 of the Classifier of Professions, DK 003:2010) in the Canine Training Centre of the State Border Service of Ukraine.

The provisions on the feeding of working dogs are also outdated (Legislation of Ukraine, 2001). However, positive changes regarding the feeding of working dogs of the canine units of the State Customs Service of Ukraine with dry food are worth noting (Legislation of Ukraine, 2021a).

The use of dogs that do not meet the requirements for work in the canine unit because of their health or age has not been fully regulated. Legislative regulation of the status of working dogs is also required.

Detection, patrol and search, special, convoy, guard dogs, reserve, breeding dogs, puppies are used in canine units of Ukraine. For example, the concepts of a border service detection dog, a border control detection dog, a special dog, a mine detection dog, a guard dog, a breeding dog, a service dog, puppies were introduced in the border canine service (Legislation of Ukraine, 2018b). According to the introduced changes, detection and attack dogs are legally established in the State Border Service (State Border Service of Ukraine, 2022). These changes include the possibility of transferring dogs for care and lifelong maintenance to a canine inspector, as well as natural or legal persons of any form of ownership upon their consent.

The storage conditions of the original scents shall be revised. The legislation of Ukraine provides for a possibility of using original narcotic and psychotropic substances during a special canine training course (Legislation of Ukraine, 2009). However, this option does not find practical application because of insufficiently regulated method of storage of such substances, as well as the conditions of their use. This is why the employees are not willing to bear responsibility for the failure to comply with the relevant requirements. Scent substitutes are mostly used in such cases, which do not create a more stable reflex in the dog.

In 2022, in view of the consequences of the criminal aggression of the Russian Federation, there is an insufficient level of organizational, legal and material support of canine units during the martial law in Ukraine.

4. Discussion

It can be stated that allowing animals to engage in species-specific behaviours can lead to an overall positive state of well-being, provided the minimization of negative affective experiences. Recognizing the vulnerability of working dogs leads to moral obligations and duties of justice (Vink, 2020). Industries that depend on working dogs must be proactive and transparent in ensuring that their animal breeding and animal care practices do not disappoint community expectations (China *et al.*, 2020). This is obligatory if people want animals to continue to perform these roles (Gibson and Oliva, 2022).

It can be concluded that the use of digital technologies provides dog handlers with real-time information about the behaviour of working dogs and the environment in which they work. Related digital technologies can measure aspects of dogs' behaviour to assess temperament, predict training success, and even monitor health (Bozkurt *et al.*, 2014).

The use of cyber-physical systems to complement the two-way exchange of information between dog handlers and dogs will enhance the sensory

capabilities of working dogs and help them save more lives (Bozkurt *et al.*, 2014). Combining data streams obtained from body and airborne sensors can provide more effective performance of remote scent detection tasks (Foster *et al.*, 2022). This will also ensure the well-being of the working dog in a potentially dangerous environment.

It can be stated that animal-oriented digital technologies help people to manage them. It is very important to carefully and consistently assess the problems arising from the use of animal-oriented technologies (Van der Linden, 2021). According to the researcher, the development of hardware and software should be carried out in cooperation with those who understand physiology and behaviour of animals.

It was found that cases of actual reduction of the amount (weight) of the narcotic substance due to its physical properties (airing, evaporation) are possible in the process of training. Such a situation can be considered from the perspective of appropriation of a narcotic substance by a dog handler (Seliukov, 2020). According to the researcher, the process of regulatory settlement of this issue requires a more careful and thorough study of the physical properties of narcotic substances in terms of their use for dog training.

It can be stated that the proper resource provision, including the provision of digital technological equipment, is the key to the effective operation of canine units. Canine units are not a priority area of public funding in view of the current political, social and economic situation in Ukraine (Seliukov, 2020). Further development of this industry depends on the increase of financial investment. The researcher states that changing the principles of the distribution of the budget for canine support is a priority. The development of measures aimed at including the canine service in the complex of defence activities at the level of the state policy of Ukraine is also of great importance (Bezpalova, 2020).

Conclusions

Providing improved external conditions allows working dogs to exercise freedom of action with potentially positive affective results. They have more opportunities for voluntary independent purposeful behaviour that they may find useful. The sale and transportation of drugs, smuggling, an increased number of armed conflicts, and acts of terrorism indicate the urgency of continuing to use working dogs as a valuable asset for law enforcement agencies.

European K9 units are an important part of law enforcement. They provide support and assistance in a variety of operations, including

patrolling, drug control and emergency response. They help find missing persons, track lost or stolen items, detect firearms and ammunition, as well as track and arrest crime suspects. Dog handlers have an additional responsibility to protect their companion dog from undue risk. The dog shall be intelligently obedient to hand signals, voice commands, and premeditated training procedures.

Digital technologies are constantly evolving, the pace of development of new equipment for service dogs and related tactics is accelerating significantly. Many projects in European countries are aimed at achieving wearable modern digital equipment, appropriate ammunition and inventory for working dogs. Sensory interfaces in the form of vibrating motors, UAV-based surveillance sensors, tracking devices in the form of video camera systems and similar to GPS are gradually becoming components of modern European requirements for canine services.

Investment in new tools and training will allow K9 units to remain more effective and safer. One of the objectives of the INGENIOUS Project is to develop a set of wearable technologies and small sensors that protect and empower emergency responders and their K9 companions during response operations. The designed K9 vest for a search dog that is involved in the work of the relevant unit can be an example. The developed innovative device such as Hot-N-Pop Pro and K9 Heat Alarm Pro, which monitors information about the temperature in the car, is also worth noting.

Canine units of Ukraine responsibly perform their official duties in relation to compliance with laws, maintenance of public order and provision of public safety in different areas of law enforcement. In 2022, Ukraine does not provide a sufficient organizational, legal and material support for canine units in the context of approbation of digital technologies during the martial law in view of the consequences of the criminal aggression of the Russian Federation.

The mentioned European options of modern digital equipment for working dogs, using the example of complex digital developments of the INGENIOUS Project, and innovative devices such as Hot-N-Pop Pro and K9 Heat Alarm Pro can be used as examples for the implementation of appropriate digital equipment for canine units in Ukraine. These innovations will become a further vector of research in the context of conducting comparative law studies.

Bibliographic References

ACEK9.COM. 2022. Designer, Manufacturer and Distributor of the best canine vehicle safety equipment Since 1986. Available online. In: <https://www.acek9.com/>. Consultation date: 22/05/2022.

- BEZPALOVA, Olha. 2020. Canine support of the security and defense sector of Ukraine during the organization of planning and response to threats." In: The collection of theses of the scientific and practical seminar "Peculiarities of the organization of canine activities of law enforcement agencies in Ukraine. Kharkiv National University of Internal Affairs. Kharkiv, Ukraine.
- BOZKURT, Alper; ROBERTS, David; SHERMAN, Barbara; BRUGAROLAS, Rita; MEALIN, Sean; MAJIKES, John; YANG, Pu; LOFTIN, Robert. 2014. "Toward cyber-enhanced working dogs for search and rescue" In: IEEE Intelligent Systems. Vol. 29, No. 6. pp. 32–39.
- BRAY, Emily; OTTO, Cynthia; UDELL, Monique; HALL, Nathaniel; JOHNSTON, Angie; MACLEAN, Evan. 2021. "Enhancing the selection and performance of working dogs" In: *Frontiers in Veterinary Science*. Vol. 12, No. 8, paper 644431.
- CARABINIERI. 2022. Airborne squadrons 'Hunters'. Available online. In: <https://www.carabinieri.it/chi-siamo/oggi/organizzazione/territoriale/gli-squadroni-eliportati-cacciatori>. Consultation date: 22/05/2022.
- CHANEY, Paul; JONES, Ian Rees; FEVRE, Ralph. 2021. "Exploring the substantive representation of non-humans in UK Parliamentary Business: A legislative functions perspective of animal welfare petitions, 2010–2019" In: *Parliamentary Affairs*, Vol. 75, No. 44, pp. 813–842.
- CHINA, Lucy; MILLS, Daniel; COOPER, Jonathan. 2020. "Efficacy of dog training with and without remote electronic collars vs. a focus on positive reinforcement." In: *Frontiers in Veterinary Science*. Vol. 7, paper 508.
- COBB, Mia; OTTO, Cynthia; FINE, Aubrey. 2021. "The animal welfare science of working dogs: Current perspectives on recent advances and future directions" In: *Frontiers in Veterinary Science*. Vol. 8, paper 666898.
- COUNCIL OF EUROPE. 1987. European Convention for the Protection of Pet Animals. Strasbourg, 13.XI.1987. Available online. In: <https://rm.coe.int/168007a67d>. Consultation date: 22/05/2022.
- DOUKLIAS, Athanasios; KROMMYDA, Maria; AMDITIS, Angelos. 2021. Resilient communications for the first responders at the field. In: Asia-Pacific Conference on Communications Technology and Computer Science (ACCTCS). IEEE. Available online. In: <https://doi.org/10.1109/ACCTCS52002.2021.00016>. Consultation date: 22/05/2022.
- EUR-LEX. 2019. "Regulation (EU) 2019/1896 of the European Parliament and of the Council of 13 November 2019 on the European Border and Coast Guard and repealing Regulations (EU) No 1052/2013 and (EU)

- 2016/1624” Available online. In: <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1573722151667&uri=CELEX:32019R1896>. Consultation date: 13/06/2022.
- FOSTER, Marc; WU, Tianfu; ROBERTS, David; BOZKURT, Alper. 2022. “Preliminary evaluation of a system with on-body and aerial sensors for monitoring working dogs” In: *Sensors*. Vol. 22, No. 19, paper 7631.
- GENEVA INTERNATIONAL CENTRE FOR HUMANITARIAN DEMINING. 2022. “About IMAS.” Available online. In: <https://www.mineactionstandards.org/en/about-imas/>. Consultation date: 13/06/2022.
- GIBSON, Paris Emmanuelle; OLIVA, Jessica Lee. 2022. “Public perceptions of Australian assistance dogs: Happier and better used than companion dogs” In: *Journal of Applied Animal Welfare Science*. Vol. 25, No. 1, pp. 18-30.
- GRIERSON, Jamie. 2022. “Dog awarded animals’ Victoria Cross for RAF service in Afghanistan.” In: *The Guardian*. Available online. In: <https://www.theguardian.com/uk-news/2022/feb/22/dog-awarded-animals-victoria-cross-for-raf-service-in-afghanistan>. Consultation date: 22/05/2022.
- INGENIOUS. 2022. *Aims & Objectives*. Available online. In: <https://ingenious-first-responders.eu/aims-objectives/>. Consultation date: 13/06/2022.
- LAZAROWSKI, Lucia; WAGGONER, Lowell Paul; KRICHBAUM, Sarah; SINGLETARY, Melissa; HANEY, Pamela; ROGERS, Bart; ANGLE, Craig. 2020. “Selecting dogs for explosives detection: Behavioral characteristics.” In: *Frontiers in Veterinary Science*, Vol. 7, paper 597.
- LEGISLATION OF UKRAINE. 2001. Decree of the Cabinet of Ministers of Ukraine of October 15, 2001 No. 1348. On feeding standards for staff animals of military units, institutions and organizations of the Armed Forces, other military formations, structural units of the State Special Transport Service, bodies and units of the National Police, civil defense and criminal executive service. Available online. In: <https://zakon.rada.gov.ua/laws/show/1348-2001-%D0%BF#Text>. Consultation date: 22/05/2022.
- LEGISLATION OF UKRAINE. 2009. Decree of the Cabinet of Ministers of Ukraine of July 29, 2009 N 831 On approval of the Procedure for the use of narcotic drugs and psychotropic substances during the training of service dogs to search for such drugs and substances. Available online. In: <https://zakon.rada.gov.ua/laws/show/831-2009-%D0%BF#Text>. Consultation date: 22/05/2022.

- LEGISLATION OF UKRAINE. 2014. Order of the Ministry of Internal Affairs of Ukraine dated 05.08.2014 No. 772 On the approval of the Instructions for the Organization of Service Canine in the National Guard of Ukraine. Available online. In: <https://zakon.rada.gov.ua/laws/show/z1213-14#Text>. Consultation date: 22/05/2022.
- LEGISLATION OF UKRAINE. 2016. Order of the Ministry of Internal Affairs of Ukraine dated 01.11.2016 No. 1145 On the approval of the Instructions for organizing the activities of canine units of the National Police of Ukraine. Available online. In: <https://zakon.rada.gov.ua/laws/show/z1544-16#Text>. Consultation date: 22/05/2022.
- LEGISLATION OF UKRAINE. 2017. Order of the Ministry of Internal Affairs of Ukraine dated 24.05.2017 No. 442 On approval of the Concept for the development of canine services of central executive bodies, whose activities are directed and coordinated by the Cabinet of Ministers of Ukraine through the Minister of Internal Affairs, and the National Guard of Ukraine until 2020. Available online. In: <http://consultant.parus.ua/?doc=OAOSEF60A6>. Consultation date: 22/05/2022.
- LEGISLATION OF UKRAINE. 2018a. Order of the Ministry of Internal Affairs of Ukraine dated 11.07.2018 No. 597. On the approval of the Instructions on the organization of the activities of canine divisions of the State Emergency Service. Available online. In: <https://zakon.rada.gov.ua/laws/show/z0896-18#Text>. Consultation date: 22/05/2022.
- LEGISLATION OF UKRAINE. 2018b. Order of the Ministry of Internal Affairs of Ukraine dated March 26, 2018 No. 234 On the approval of the Instructions for the organization of canine support in the State Border Service of Ukraine. Available online. In: <https://zakon.rada.gov.ua/laws/show/z0459-18#Text>. Consultation date: 22/05/2022.
- LEGISLATION OF UKRAINE. 2021a. Order of the Ministry of Finance of Ukraine dated 10.03.2021 No. 148 On canine support in the State Customs Service of Ukraine. Available online. In: <https://zakon.rada.gov.ua/laws/show/z0565-21#n10>. Consultation date: 22/05/2022.
- LEGISLATION OF UKRAINE. 2021b. “Order of the Ministry of Finance of Ukraine dated 19.03.2021 No. 161 On the approval of procedures for the use of canine teams, veterinary service, maintenance, feeding and care of service dogs in the State Customs Service of Ukraine.” Available online. In: <https://zakon.rada.gov.ua/laws/show/z0663-21#Text>. Consultation date: 22/05/2022.
- LEGISLATION.GOV.UK. 2006. Animal Health and Welfare (Scotland) Act 2006. Available online. In: <https://www.legislation.gov.uk/asp/2006/11/contents>. Consultation date: 22/05/2022.

- MELLOR, David; BEAUSOLEIL, Ngaio; LITTLEWOOD, Katherine; MCLEAN, Andrew; MCGREEVY, Paul; JONES, Bidia; WILKINS, Cristina. 2020. "The 2020 five domains model: Including human-animal interactions in assessments of animal welfare" In: *Animals (Basel)*. Vol. 10, No. 10, paper 1870.
- OSCE. 2022. Support to strengthening of the Canine (K9) capacity of the Police Services to detect and confiscate SALW, ammunition and explosives. Available online. In: <https://salw.osce.org/Projects/ViewPage/2101100-support-to-strengthening-of-the-canine-k9-capacity-of-the-police-services-to-detect-and-confiscate-salw-ammunition-and-explosives>. Consultation date: 13/06/2022.
- PALMER, James. 2021. "How a new squad of elite sniffer dogs is catching cybercriminals" In: *The Times*. Available online. In: <https://www.thetimes.co.uk/article/digi-dogs-police-sniffer-dogs-cybercrime-lmbz5k5c>. Consultation date: 22/05/2022.
- PAVLIUK, Oleh. 2022. Patron the dog received an award from Zelenskyi. In: *Suspilne*. Available online. In: <https://suspilne.media/237231-pes-patron-otrimav-nagorodu-vid-zelenskogo/>. Consultation date: 13/06/2022.
- PETERSEN, Stèphan; SCHOON, Adee. 2021. Dogs as detectors for hidden digital storage devices: A pilot study from the National Police of The Netherlands. Lauryn E. DeGreeff, Craig A. Schultz, Eds., *Canines. The Original Biosensors*. Jenny Stanford Publishing, New York, USA.
- RICCI, Giovanna; NITTARI, Giulio; CAMPANOZZI, Laura Leondina; FEOLA, Alessandro; MAZZALUPI, Giuseppina; CEGLIE, Lorenzo; SIRIGNANO, Ascanio. 2021. "Use of detection dogs in forensic investigations: The Italian scenario" In: *Romanian Society of Legal Medicine*. Vol. 29, No. 1, pp. 69-73.
- SELIUKOV, Vadym. 2020. "Prospects for the improvement of legal regulation of canine activities in Ukraine" In: *Administrative law and process*. Vol. 11. <https://doi.org/10.32849/2663-5313/2020.11.26>. Consultation date: 22/05/2022.
- SHVETS, Dmytro. 2020. Problems of the functioning of cynological units in Ukraine at the current stage. The collection of theses of the scientific and practical seminar "Peculiarities of the organization of canine activities of law enforcement agencies in Ukraine". Kharkiv National University of Internal Affairs. Kharkiv, Ukraine.

- STATE BORDER SERVICE OF UKRAINE. 2022. Special purpose dogs and lifelong maintenance of four-legged pensioners, new norms for canine provision of the State Police Service of Ukraine have been approved. Available online. In: <https://dpsu.gov.ua/ua/news/sobaki-specpriznachenci-ta-pozhittve-utrimannya-chotirilapih-pensioneriv-zatverdzheno-novi-normi-kinologichnogo-zabezpechennya-dpsu/>. Consultation date: 13/06/2022.
- STATE CUSTOMS SERVICE OF UKRAINE. 2021. Cynological support. Available online. In: <https://dspkz.customs.gov.ua/%d0%ba%d1%96%d0%bd%d0%be%d0%bb%d0%be%d0%b3%d1%96%d1%87%d0%bd%d0%b5-%d0%b7%d0%b0%d0%b1%d0%b5%d0%b7%d0%bf%d0%b5%d1%87%d0%b5%d0%bd%d0%bd%d1%8f/>.
- STATE SERVICE OF UKRAINE FOR EMERGENCY SITUATIONS. 2021. “Public report of the Head of the Emergency Situations Service on the results of the State Emergency Service of Ukraine in 2021.” Available online. In: <https://dsns.gov.ua/upload/2/6/8/1/6/9/1VSPPfkqdkExu8pkT9nQ6J8VV4MIcND2gG9vEIBb.pdf>. Consultation date: 22/05/2022.
- SWEDISH ARMED FORCES. 2022. “Department of Breeding” Available online. In: <https://www.forsvarsmakten.se/en/about/organisation/training-units-schools-and-centres/life-guard-regiment/swedish-armed-forces-dog-training-center/department-of-breeding/>. Consultation date: 22/05/2022.
- UNDP. 2020. Kosovo Police K9 Unit receives five dogs to detect new technology weapons. Available online. In: <https://www.undp.org/kosovo/press-releases/kosovo-police-k9-unit-receives-five-dogs-detect-new-technology-weapons>. Consultation date: 13/06/2022.
- VAN DER LINDEN, Dirk. 2021. “Interspecies information systems” In: Requirements Engineering. Vol. 26, pp. 535-556.
- VINK, Janneke. 2020. “Enfranchising animals in legal institutions: Fundamental legal rights.” In: Andrew Linzey and Clair Linzey (Eds.), *The Open Society and Its Animals. The Palgrave Macmillan Animal Ethics Series* (pp. 263-335). Palgrave Macmillan. Cham.
- VOSINAKIS, Georgios; KROMMYDA, Maria; STAMOU, Angelos; MITRO, Nikos; PALAZIS-ASLANIDIS, Marios; VOULGARY, Katerina; ATHANASIADIS, Spyros; AMDITIS, Angelos. 2022. “Smart integrated vest for the canine companion of the K9 units” In: *Informatics*. Vol. 9, No. 1, paper 2.



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