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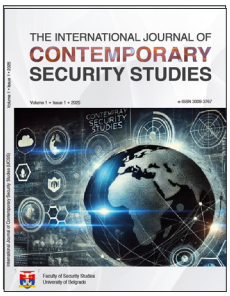

Research article

Use of Small Unmanned Aircraft Vehicles (SUAV) in Police Work

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ABSTRACT

The technical and technological revolution and the development of artificial intelligence are accelerating the development of technical means, both those used for military, civilian, and police purposes. Small unmanned aerial vehicles (sUAV) have become a modern means of warfare in world hotspots in just a few years, while domestically, the police forces of developed countries have recognized the potential for their application within the framework of their operational duties and tasks. Many police operational duties and tasks can be performed more effectively or efficiently with sUAVs. Taking all of the above into account, this paper aims to present the potential of sUAVs for police work using a descriptive-analytical approach. The scientific justification of the theoretical study of this topic is reflected in the topicality and the need to expand scientific knowledge about the subject of research. The authors collected data through a qualitative analysis of existing literature on the use of sUAVs by police forces in developed countries and on positive examples of their use. The limitation of this research is reflected in the analysis of the possibility of using sUAVs only within specific police organizational units. It encourages other researchers to approach this topic in a multidisciplinary manner to more fully and comprehensively analyze the needs for the use of sUAVs in the work of the police and the Ministry of Internal Affairs.

KEYWORDS

sUAV; drones; police; artificial intelligence; police technical equipment.

1. Introduction

Small unmanned aerial vehicles (sUAVs) are among the most dynamic and fastest-growing technologies today. Equipped with advanced sensors, GPS systems, and autonomous control capabilities, these aircraft are widely used in fields ranging from agriculture and surveying to security and rescue missions, as well as scientific research and commercial services.

The development of sUAVs over the last decade has been driven by advances in robotics, artificial intelligence, telecommunications, and the miniaturization of electronic components. Their ability to perform tasks in difficult-to-reach, dangerous, or inaccessible places while reducing costs and risks for the human factor makes them an indispensable tool in many sectors.

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Despite significant progress, sUAV systems face numerous challenges, including limited battery power, navigation in complex environments, data security, and regulatory frameworks. Further research and development in this area is essential to improve their performance and safety, as well as to increase their integration into everyday activities.

Many governments believe that drones can bring a competitive advantage to their country's development, which is why they are taking political and economic measures to encourage this sector and urban air mobility. It is expected that citizens in urban areas will widely accept drones, but it is necessary first to address key challenges, such as safety and social issues (Çetin et al., 2022).

The development of drones for civilian and military purposes has proceeded in two tracks. With their development, today we have drones ranging from small dimensions, 2cm x 2cm x 2cm, to those weighing several tons. Their prices also vary, but today they are more affordable than ever for the average citizen.

The totality of all these factors ultimately led to a massive increase in the number of private drones in many developed countries, including, of course, the European Union, where the European Aviation Safety Agency (EASA) estimates that their share of the aviation market will reach as much as 10% in the next 10 years, which is about 15 billion euros per year, and that they will create up to 150,000 jobs by 2050 (European Commission 2014).

The research question we are starting from is: What are the advantages and potential of using small drones in police work? In this regard, using the analysis method, we will describe (descriptive role) the research problem and explain (explanatory role) the characteristics inherent to small drones in the police sector, given the differences relative to the role of drones in the military sector. We will also explain how small drones function, in what situations they are used, and what their scope of action is. Based on the described and explained phenomena and processes, using the synthesis method, we will try to understand the complex whole, that is, to connect the individual segments in order to understand the potential of using small drones in police work. Through a qualitative analysis of available documents and reports (primarily from relevant institutions and organizations involved in the development of artificial intelligence, such as unmanned aerial vehicles), we will collect and process data relevant to the paper's topic. We will use relevant domestic and foreign literature to define the theoretical framework. The primary goal of the paper is to review relevant sources on the research problem, as this field remains underresearched. Therefore, we used the available literature and research on representative samples from around the world.

2. Drones – definition and classification

As drones have developed and their capabilities have evolved, their names have also changed. The terminology used today for UAVs (unmanned aerial vehicles) is still not clearly and/or universally defined (Pavlović, 2017). Drones can be divided into two main categories: remotely piloted and autonomous drones. The term UAV refers to an autonomous drone, while RPA (remotely piloted aerial vehicle) refers to a drone remotely piloted by a human operator. Since neither of these drones has a pilot on board, and UAVs can have varying levels of autonomy – either under operator control or via a pre-programmed trajectory – less autonomous UAVs can be considered a subcategory of RPA drones.

The term "drone" originates from military terminology (Mendes de Leon & Scott 2016), but has become widely accepted to refer to both UAVs and RPAs. Broader terms, such as unmanned aircraft systems (UAS) and remotely piloted aircraft systems (RPAS), encompass not only the aircraft but also the complete support for its operation, including ground command stations, communication networks, and operational equipment. The lack of standardization of terminology further complicates the situation. For example, the European Aviation Safety Agency (EASA) considered several terms, including UAS and RPAS (a subcategory of UAS), before settling on the widely accepted term "drone." EASA defines a drone as an aircraft without a pilot on board, which is controlled autonomously or remotely from the ground or another vehicle. In contrast, the International Civil Aviation Organization (ICAO) does not use the term "drone", but prefers RPAS and UAV. The drone industry is developing rapidly, which leads to the emergence of new terms and the redefinition of existing ones. When discussing the police, we encounter the term "police robot" in the literature (Glaser, 2016) and the term "police drone," which, in a certain sense, specifies their purpose (Yefimenko, 2022).

In Serbia, the term "drone" is much more commonly used in everyday speech than "unmanned aircraft". The European Aviation Safety Agency defined that "Drone shall mean an aircraft without a human pilot on board, whose flight is controlled either autonomously or under the remote control of a pilot on the ground or in another vehicle" (European Aviation Safety Agency 2015). Although there is no consensus on the term, the authors believe that unmanned aircraft refers to a wide range of aircraft without a pilot for non-military purposes. In contrast, drones are equipped with weapons and designed to destroy manpower. In addition, the French Directorate for Civil Aviation (DGAC) uses the term "drone" to refer to an unmanned aircraft equipped with weapons for military purposes. UAS systems can be classified by various characteristics, including aircraft type (fixed-wing or rotorcraft), altitude capability (high, medium, low), weight, speed, resistance, capacity, etc. (Table 1). In police practice, UAS systems weighing up to 25 kg are most commonly used. According to aviation industry standards, they are known as small unmanned aircraft systems (sUAS). These lightweight and portable vertical take-off and landing aircraft are powerful enough to carry high-quality cameras, sensor packages, and advanced technologies such as GPS, allowing them to fly autonomously along a predetermined route. Typical flight times for these devices range between 10 and 45 minutes. Given their frequent use in the police, the term sUAS will be used in the remainder of this paper.

Table 1. Classification of unmanned aerial vehicles[1]

UAS				
Size/Weight	Purpose	Range/Endurance	Altitude	Flight Mechanism
Nano UAS (micro drones for surveillance)	Civilian UAVs (Hobby drones and personal use)	Very Short-Range UAVs (Up to 5 km)	Low-Altitude UAVs (Operate below 300 m)	Fixed-Wing UAVs (Airplane-like design)
Micro UAVs (Lightweight and portable)		Short-Range UAVs (5–50 km)		
Mini UAVs (Under 25 kg, used in commercial and military applications)	Commercial UAVs (Delivery, photography, mapping)	Medium-Range UAVs (50–200 km)		Rotary-Wing UAVs (Helicopter-like, multirotors)
Small UAVs (SUAVs) (Up to 150 kg, often used for tactical operations)	Industrial UAVs (Used in agriculture, construction, and energy)	Long-Range UAVs; MALE - Medium Altitude Long Endurance (Up to 1000 km)	Medium-Altitude UAVs: Operate between 300 m and 9000 m	Hybrid UAVs; VTOL - Vertical Take-Off and Landing (Combine fixed-wing and rotary capabilities)
Medium UAVs (Up to 600 kg, with greater endurance and range)				
Large UAVs (Above 600 kg, used for long-range missions and heavy payloads)	Research UAVs (Deployed for scientific data collection)	Strategic UAVs; HALE - High Altitude Long Endurance (Over 1000 km)	High-Altitude UAVs: Operate above 9000 m	Flapping-Wing UAVs (Mimicking Birds or Insects)

1 Authors based on NATO Classification

3. Possibilities of using small unmanned aerial vehicles in police work

The use of small unmanned aerial vehicles in police work is a recent development, with police in modern countries recognizing their advantages for performing duties more efficiently and effectively. Their accessibility has increased exponentially since 2000, as evidenced by more than 1,578 state and local public safety agencies in the United States using sUAS (Gettinger, 2020).

In line with the technical and technological development of society, police organizations also use modern capabilities to perform their duties more easily, faster, and with higher quality. Citizens' expectations of the police are always at the highest level; therefore, police organizations must follow modern trends in the use of technical means to meet the requirements of the end users of their services. The police are expected, through their organization and functioning in society, to increase the likelihood of providing rapid protection to the lives, health, and property of citizens whenever necessary. Their work includes preventing and solving crime, controlling traffic, searching for fugitives or missing persons, and securing significant public events, among other everyday tasks. In such situations, to enable rapid action and collect important information from the air, the assistance of air units may be required (Milić & Milidragović, 2019).

The advantages of using sUAS are multiple, both in preventive and repressive police work. The ability to view the situation from a "bird's eye view", the speed of arrival at the scene, access to inaccessible terrain, as well as documentation in the form of photographs and videos in correlation with accessibility in terms of procurement and maintenance are just some of the advantages for their use or introduction into the organizational units of the Ministry of Internal Affairs, if this has not been the case so far. Organizational units of the Ministry of Internal Affairs can use small unmanned aerial systems in both regular and emergency tasks (rescue), in crises (hostage or terrorist), maintaining public order and peace during public gatherings, in detecting violations of road traffic safety, search activities, conducting on-site inspections, secret surveillance of persons, surveillance of the state border, etc. For these purposes, many countries around the world, such as the USA, Germany, France, Canada, the UK, Brazil, China, as well as cities such as Dubai, use small drones to support the work of police units (de Castro Quirino et al.; Gettinger, 2020; Saulnier & Thompson, 2016; Yefimenko, 2022). A 2021 DroneResponders survey shows that more than 600 law enforcement agencies use drones worldwide (Martin, 2022). It has been shown that the way drones are used plays a key role in shaping public opinion. In the US, citizens see them as applicable in situations such as search and rescue, highway traffic accidents, and emergency response during bomb threats or armed incidents (Heen et al., 2018; Sakiyama et al., 2017).

The positive practices of world police forces in the use of sUAVs for police tasks, as well as the operational and cost-effectiveness of unmanned aerial vehicles, justify their introduction into our police work. The first task in this regard would be to standardize authorization for the use of UAVs under the Police Act. The legal basis for the use of unmanned aerial vehicles capable of processing personal data should be defined with a clear goal and purpose (Milidragović & Milić, 2023).

When discussing the limitations of unmanned aerial systems, the first significant challenge is weather conditions, because the atmosphere, as a variable and unpredictable element shaped by wind, precipitation, and fog, imposes restrictions on their use (Ranquist et al., 2017). Police are increasingly facing how atmospheric instability and unevenness affect the operational capabilities of drones. Another key factor is limited battery life, which directly affects the range and shape of the areas where drones can be used. In third place, but with a more minor impact compared to the previous two factors, is the already mentioned legal framework that regulates their use and raises questions such as: the legitimacy and ethical aspects of using drones for monitoring, surveillance and protection, the right to privacy, freedom of movement, ethical principles of the use of force and issues of potential abuse (Klauser, 2021).

The way in which drones are introduced into police organizational units varies. Some organizational units have systematized drone operator positions within their organizations. In contrast, in the Netherlands, a special organizational unit was formed that works closely with the regional police departments. The members of these drone teams come from various professional fields, including members of local police units, motorized patrols, emergency services and control centers, criminal investigations, dog handler teams, anti-human trafficking units, and water and traffic surveillance teams. Compared to tasks in other police units, working with small drones carries significantly less risk and does not involve the use of force. Police activities involving small drones are primarily limited to providing real-time imagery and recording material later used in investigations to support other teams (van der Maarel, 2025).

3.1. The possibility of using small drones in the work of the general police

Small drones have not yet become a standard tool for general police use. Of course, in more developed countries, this is in full swing, while in Serbia, whether due to legal uncertainty or a lack of material resources, the use of drones is currently the exclusive right of only specific organizational units.

Before small drones were introduced into police work, police officers could only receive air support from helicopters. Today, every police patrol can have its own "air support" in the trunk of a patrol vehicle, ready to use when needed. Although the advantages of small drones are obvious and confirmed by numerous successful cases of their use in police practice, they should not be seen as a replacement for traditional manned aviation, but as a complement to it (Shinnamon & Cowell, 2019). However, for the general police, the use of air support, such as helicopters, is unattainable, and small drones are the only option they can afford. Therefore, we will write about the possibilities of using small drones in the regular work of the general police, and about the tasks that fall within the competence of police officers in Regional Police Directorates that are directly connected to the Police Directorate.

Regular tasks of police officers certainly include going to the scene of an incident. This is preceded by a report from citizens or from police officers themselves, who learn about the incident. Every situation in which police officers intervene carries a particular risk, while certain situations where participants have cold or firearms with them, or who are under the influence of alcohol, carry a higher risk of victimization of police officers (Petrović, 2021). The use of small drones in such cases implies a kind of "precedent" for police officers. Of course, this would not affect the responsiveness of police officers, as the drone would arrive at the scene faster and collect important information by observing the scene for the patrol arriving. This information would relate to the location of the incident itself (terrain configuration, weather conditions, access to the scene of the incident), then to the people (number and arrangement of people, whether someone is armed, whether there are any injured people) and a lot of other information that police officers may not have received from the person reporting the incident. This information can be crucial in preparing police officers for intervention and on-duty service, and, if necessary, could send additional forces to the scene of the incident even before the patrol arrives and requests reinforcements. The "first response" function of small drones was developed by the Chula Vista Police Department in San Diego in 2018 and implies that, in emergency cases, they are the first to arrive on the scene after the call. Thus, drones can be on the scene before police officers arrive and, by transmitting live images, provide information to approaching officers, allowing for incident assessment and decision-making (Werner, 2025). In many situations (not all), this way of using drones can replace more expensive and demanding actions involving helicopters and crews.

Since 2020, Dubai Police has been using a network of small drones to combat crime. These drones are deployed in special bases with sliding roofs, which allows them to enter the field quickly. They can patrol autonomously or be sent to a specific location, where operators from the police headquarters use them to monitor the situation, track suspicious people or vehicles, and coordinate with other police units. Thanks to this system, the police are expected to respond to incidents within 1 minute, almost 4 times faster than before (Hambling, 2021).

Police officers directly carry out work to prevent violations and restore public order on a larger scale, as well as to increase security measures at sporting events and other public gatherings. The use of drones in performing such tasks is reflected in the preventive surveillance of the gathered crowd from a "bird's eye view" as well as documenting video recordings of rioters when violating public order and peace for their later identification and prosecution. Also, drones in these situations can be a powerful tool to support managers' decision-making because they can provide a "live" broadcast of crowd movement to inform possible redeployment of police forces.

3.2. The possibility of using small drones in the work of traffic police

The traffic police is an organizational unit of the Ministry of Internal Affairs with which citizens most often come into contact, and constant work is underway to improve its work. With the development of large cities worldwide and increasing population density and traffic, it is necessary to introduce innovative systems that can adequately respond to tasks. In Serbia, a lot of attention has recently been paid to improving the technical capacities of the Traffic Police Directorate by introducing body cameras and increasing the presence of inter-

ceptors to enforce speed limits. Also, many cities in Serbia have cameras for automatic detection of violations, such as running a red light, driving without a seat belt, exceeding the speed limit, driving in the stop lane, using a mobile phone while driving, and the like.

Aerial traffic surveillance can be crucial for quickly detecting the location of an incident and the level of response required. Specific categories of incidents, such as collisions, stalled or stranded vehicles, and other road debris, often lead to severe traffic congestion, especially during "rush hour," when it may be difficult for ground vehicles to quickly reach the scene (Spasovic et al., 2017). The main advantage of small unmanned aerial vehicles (sUAS) compared to traditional traffic control resources (e.g., police cars and speed cameras) is their ability to provide a "bird's eye view" of drivers, as well as their mobility, which is not limited by the road network and traffic congestion (Rosenfeld, 2019). The use of small unmanned aerial vehicles can significantly improve traffic surveillance and violation identification. For example, they can more easily spot drivers who ignore traffic signs, use the stop lane when it is not allowed, overtake at risk, or behave irresponsibly on the road. Research shows that drones for traffic control are perceived as a more efficient and effective means of preventing violations compared to helicopters. At the same time, they are considered equally reliable as speed cameras in terms of surveillance accuracy (Rosenfeld, 2019). Also, the use of drones is efficient in rural areas, where there are few technical means for automated detection of violations. In these situations, police officers can use drones as an "extra pair of eyes" that is less conspicuous than a patrol car, which controls traffic; drivers often show solidarity and warn each other of the presence of a police patrol using so-called flashing lights. It is important to keep in mind that road traffic accidents are the cause of numerous deaths worldwide, approximately 1.19 million per year, and that road traffic injuries are the leading cause of death for children and young people aged 5 to 29 (WHO, 2023). Therefore, additional traffic control using small drones could also have a preventive character, that is, reducing the likelihood of serious violations by, first of all, showing solidarity with drivers or by prior knowledge that a fixed traffic control camera is located in a particular place. The usefulness of drones would be particularly pronounced in video surveillance of traffic curves where overtaking is prohibited, and traffic accidents have occurred.

Small drones can be helpful in situations where a vehicle is stopped, as they provide a quick insight into the driver's condition – whether he is injured, ill, or has a problem with the vehicle. Based on this information, a tow truck can be called promptly and given precise arrival instructions. In addition, they can be used to monitor pedestrian traffic, especially in densely populated areas (Zhu et al., 2019).

Small drones are also invaluable during serious traffic accidents, as they provide an overview of the extent of the collision and its impact on traffic, facilitating vehicle rerouting and more efficient emergency services intervention and evacuation (Werner, 2015). Thanks to advanced recording technologies, GNSS systems, and photogrammetry, aerial video footage is becoming increasingly accurate, enabling detailed analysis of the scene of a traffic accident. This is especially important when investigating multiple collisions, where marking and collecting evidence can be time-consuming. At the same time, it is important to record information as soon as possible to normalize traffic and reduce the risk to police officers on the scene and other road users (Milić & Milidragović, 2019). "When sUAS is utilized to map the crash scene, research has shown that the time taken to clear a crash scene and reopen the road can be reduced by 56% to 73% when compared to other measurement tools. Furthermore, the time officers were at risk in the roadway was reduced by approximately 28 minutes (78%)" (Gambold & Freeborn, 2015). Therefore, previous research shows that drones can address problems such as traffic congestion (Zhang et al., 2019), collision avoidance (Kumar et al., 2021), safety analysis (Chen et al., 2017), and driver assistance based on the "first response" principle (Butilă & Boboc, 2022).

3.3. The possibility of using small drones in the work of the criminal police

Drones, given the wide range of criminal police work, have almost inexhaustible uses as an auxiliary tool for operatives. Operative work also involves the detection, collection, interpretation, and storage of information, and this process could be significantly improved by using new technologies (Boštjan, 2016). When a crime or some other event that requires direct observation to establish the facts occurs, one of the first actions of the police is to conduct an investigation. The advantages of using drones in the investigation of criminal offenses are similar to those in traffic accident investigations. The first task is to detect criminal offenses, such as the production, possession, and sale of drugs and weapons, human trafficking, and the like (Boštjan, 2016). Then, the

photographs and recordings that miniature drones can capture are beneficial for reconstructing a crime scene and the relationships among people, objects, and traces at the scene. Research has shown that photographs taken by small drones "can provide measurements with generally acceptable levels of errors using photogrammetric techniques" (Jurkofsky, 2015). The use of small unmanned aerial vehicles can also extend to the creation of 3D models of crime scenes, ensuring the highest level of accuracy in representing the overall context, spatial arrangement, and interrelationships among relevant objects and traces (Bjelovuk et al., 2022).

The use of small drones can be helpful when implementing the operational-tactical measure of ambush. In the traditional sense, an ambush involves only the conspiratorial presence of police officers at the place where a crime is expected to be committed or the place where the perpetrators of the crime will appear in order to deprive them of their liberty. An ambush involves police officers being positioned to visually cover the security-sensitive area in which they will operate without being noticed. This is often not an easy task, and in such situations, small drones would serve as the "eyes" of police officers, while they would remain hidden nearby and not have to observe the area directly. Also, the use of small drones can improve special investigative measures, such as covert surveillance and surveillance of criminal groups' communications (Jenks, 2015). In combination with larger drones, it is possible to create a network of drones that will, on the one hand, eavesdrop on and monitor objects and persons of interest. On the other hand, cover police officers. In this context, the aim of using small drones would also be to reduce the risk to police officers' lives. FBI statistics for the period from 2015 to 2022 show that the number of police officers killed in the line of duty is increasing year by year, from 41 police officers in 2015 to 73 police officers killed in 2021 (Federal Bureau of Investigation 2020 a, 2020 b). Therefore, there is a need to introduce additional measures that would reduce the potential harm to police officers.

When it comes to police search operations, small drones can significantly enhance the effectiveness and efficiency of police officers in this area as well. Small drones equipped with cameras with automatic face detection and software connected to a database can easily recognize the persons being searched for. Here, of course, the issue of human rights and freedoms arises, as it is also a subject of public discussion regarding video surveillance cameras on city streets that have this capability (Jenks, 2015).

3.4. The potential of small drones for border policing

The need to secure borders requires new technologies that will strengthen border patrol capabilities to detect, deter, and apprehend smugglers, terrorists, and those attempting to cross the border illegally (Constantinescu & Nedelcut, 2011). Border police have always been pioneers in the use of modern technical means, precisely because protecting the state border from smuggling is a high priority for every state, and significant funds are invested in their equipment. The justification for funding small drones (and several decades of previous 'high-tech' surveillance programs) is often based on the claim that non-urban border zones are so vast that they are difficult, if not almost impossible, to monitor by any other means (Kaplan & Miller, 2019).

Land borders pass through various types of terrain: from flat alluvial areas and cliffs, to vast plains and hilly areas, as well as through mountain ranges intersected by deep valleys. Small drones can easily reach inaccessible terrains that are always a target for illegal border crossings in a short period of time. Such "air patrols" equipped with thermal imaging can serve as a replacement for pedestrian or motorized border police patrols, where, after spotting persons violating the border zone, they would alert the first stationary patrol to arrive at the critical point. Viktor Tyshchuk believes that drones have significant potential for securing and protecting national borders, but to fully utilize this potential, it is necessary to improve legal regulations and develop strategies for the use of drones in the border zone (Tyshchuk, 2024).

3.5. The possibility of using small unmanned aerial vehicles in special intervention forces (SWAT)

When we talk about the use of air forces by special and special-purpose police units, traditional understandings associate them with helicopters for faster transport of special forces to the scene of a crisis, landing on the ground or on an object. Although there is no alternative to helicopters for the rapid transport of special forces, other uses for which they were employed have been entirely replaced by small unmanned aerial vehicles.

As a means of observation, small unmanned aerial vehicles can approach inaccessible terrain and observe the scene of an event from a better position, such as a barricade, hostage situation, terrorist attack, or any other crisis requiring the engagement of special police units. The obvious and immediate advantage of using small unmanned aerial vehicles instead of a police officer in dangerous situations is that this approach protects the police officer from physical harm. Risk avoidance also has a moral significance, as states must ensure the human rights of their police officers. Providing appropriate training and equipment (including protective gear) and careful planning and management of police operations help prevent officers from being put at unintentional risk (Enemark, 2021). Thanks to advanced cameras, police can obtain crucial information about the number of suspects, the type of weapons they possess, and their exact location. Small drones with multi-rotor systems allow easy access to high-altitude or difficult-to-reach locations. At the same time, inaccessible areas that would be impassable on the ground can be easily inspected from the air (Wallace & Loffi, 2017). SWAT USA member Mark Lang said, "If we are there for less time, we can save several thousand dollars per call by using the drone" (Friese, 2022). Lang believes that drones are a cost-effective tool and should be used by special forces. "A single drone or multiple drones can break the suspect's OODA - observe, orient, decide, act - loop," explained Lang (Friese, 2022).

During an arrest, small drones provide real-time footage from a bird's-eye view, or directly from the object, allowing officers and the command center to monitor the situation and make appropriate decisions simultaneously. In emergencies, where every second can be crucial, quick access to visual data is essential. If a suspect tries to escape, a small drone can recognize the movement and alert police officers securing the perimeter. Also, if he decides to surrender, the drone can confirm that he has dropped his weapon, allowing police officers to safely approach him and deprive him of his liberty (Milić & Milidragović, 2019). Lang states that the mere presence of a drone with light and sound signals could cause a suspect to reconsider his position, distract him, or even induce him to surrender (Friese, 2022).

3.6. The possibility of using small drones in rescue operations

Some authors have already investigated the possibilities of using small drones in rescue operations and the benefits they bring to police officers (Liu et al., 2022). Also, the public generally supports the use of small drones for police responses to disasters, search and rescue, and the medical transport of the injured (Eißfeldt et al., 2020; Sabino et al., 2022; Tan et al., 2021).

Police officers, primarily fire and rescue units, take preventive measures to prevent fires and mitigate the consequences of natural disasters, technical and technological accidents (Metić, 2025; Janković, Cvetković, Gačić, Renner, & Jakovljević, 2025; Kalanj, 2025), etc., as well as to prevent threats to citizens' health due to hazardous substances and other dangerous situations. Small drones can significantly enhance the safety of police officers. At the same time, they perform their duties, whether localizing fires, searching for lost children in inaccessible terrain, or extracting injured persons from rubble. In such situations, time is of the essence, where every hour reduces the chance of successfully saving a life. Therefore, the primary goal of search and rescue missions is to rapidly and accurately locate, exchange information, and deliver supplies, all within strict time constraints (Quero & Martinez-Carranza, 2025).

The multi-rotor flight platform and its integrated avionics are designed to meet the requirements of the mountain environment, such as low temperatures, high altitudes and strong winds, ensuring the possibility of carrying various payloads (single or combined), such as: an avalanche beacon (ARTVA) with automatic signal recognition and path-following algorithms that allow for the rapid location of bodies covered in snow; cameras (visible and thermal) for the search and rescue of missing persons in snow and forests, both during the day and at night; payload deployment for the release of emergency packages or special explosive cartridges for controlled avalanche separation (Silvagni et al., 2017). In certain situations, a person may be trapped in a place that rescue teams cannot reach, even by helicopter. In such cases, small drones are more practical due to their compact size, as they can reach inaccessible terrain and, if necessary, deliver necessities such as radios, first aid, or medicine (Milić & Milidragović, 2019).

The development of technology and the integration of systems with artificial intelligence, including automated flight, high-precision sensors, and machine learning algorithms, means that drones can collect significant amounts of data, including images, videos, audio recordings, and electromagnetic signal detection. This

leads to more efficient terrain analysis, preventive action, and faster rescue operations (Khan et al., 2020; Nath et al., 2022; Quero & Martinez-Carranza, 2025).

4. Legal and Ethical Dilemmas in the Use of Small Unmanned Aerial Vehicles in Police Work

When discussing the use of UAVs in police work, numerous legal and ethical dilemmas arise. This topic occupies a central position at the intersection of law, technology, ethics, and criminal justice. It should be noted that in most modern states, this issue is at least partially regulated. In contrast, in others — including Serbia — the use of UAVs in police operations remains legally (and therefore ethically) unregulated, even though such devices are already widely used in various policing activities.

The primary legal dilemmas associated with the use of small UAVs concern privacy rights. Modern lightweight drones are often equipped with high-resolution cameras, thermal imaging devices, facial recognition systems, and other sensors, whose use may conflict with an individual's right to privacy, as guaranteed by Article 8 of the European Convention on Human Rights. The problem is further complicated by the fact that the boundary between legitimate police surveillance and unlawful intrusion into private life is not clearly defined, which leads to inconsistent interpretation of legal provisions and uneven application in practice.

Alongside the issue of privacy arises the question of the legal basis and conditions for the use of UAVs in specific operational contexts. The absence of clear regulations defining when, where, and under what conditions the police may deploy drones leads to inconsistent conduct and potential arbitrariness in practice.

A critical issue concerns judicial oversight and the procedure for issuing warrants for the use of UAVs. In cases of prolonged or targeted surveillance, it would be both legally and ethically appropriate to obtain a judicial warrant to confirm the legality of the operation and to ensure that any video recordings or photographs obtained through UAV use are admissible as evidence in court.

A gray area emerges in emergencies, when the police cannot wait for a judicial warrant— for example, during search and rescue missions, active shooter incidents, terrorist attacks, natural disasters, or traffic accidents. Although in such cases the use of UAVs may be considered justified and proportionate to the objective pursued, these situations simultaneously open the door to potential abuse and overreach of authority under the pretext of urgency.

A crucial ethical consideration concerns the principles of proportionality and necessity. The moral justification for deploying drones in policing depends on whether their use corresponds appropriately to the gravity of the incident and the level of threat to public safety. Utilizing UAVs for minor offenses or routine observation may, therefore, raise ethical concerns. Furthermore, the issue of mission creep—the gradual extension of technologies initially intended for exceptional or emergencies into ordinary policing—poses a serious challenge by enabling continuous surveillance and diminishing civilian oversight.

Equally important are the principles of transparency and accountability, which are fundamental to ethical and democratic law enforcement. Public confidence requires that citizens are fully informed about the conditions under which drones are operated. At the same time, independent supervisory mechanisms are needed to curb potential abuses of authority and ensure institutional integrity. Simultaneously, the integration of artificial intelligence into UAV systems raises complex questions about data ethics, including the accuracy of algorithmic analyses, the risks of false identification, and the safeguarding of sensitive information against misuse or data breaches.

In addition to legal and procedural issues, the deployment of UAVs influences the psychological and social environment of policing. The persistent or visible presence of drones can foster anxiety and distrust, particularly within socially vulnerable or marginalized communities. Excessive reliance on surveillance technologies risks undermining the interpersonal aspect of police work, thereby weakening cooperation and mutual trust between law enforcement and the public.

Ultimately, the ethical governance of UAVs in policing requires a delicate equilibrium between public security needs and the protection of fundamental human rights. This balance should be guided by the principles of legality, legitimacy, proportionality, and accountability, which together form the ethical foundation of respon-

sible drone use. Accordingly, legislators and policymakers should establish transparent legal frameworks that specify the scope and conditions for drone deployment, ensure judicial authorization for surveillance beyond emergencies, apply stringent data protection standards, and introduce independent oversight bodies to maintain public confidence and democratic control.

In a modern nation-state, governance is primarily about meeting the basic needs and desires of the populace through governmental institutions and procedures that are led, motivated, and guided by a well-structured and functional education system (Onimisi, 2025).

The aspiration for security, alongside the preservation of individual freedoms and rights, calls for responsible legal regulation to achieve a balanced, proportionate framework. The demonstrated effectiveness of sUAS in global policing, alongside their operational efficiency and cost advantages, underscores the rationale for integrating them into Serbian police practices. Accordingly, the Police Law should serve as the foundational legal instrument for regulating and authorizing their use.

5. Conclusions

The use of small unmanned aerial vehicles has become an indispensable part of a country's technical and technological progress in recent years. Their versatility and adaptability to diverse tasks make them a key tool across the military, civilian, and commercial sectors. The possibilities of using small unmanned aerial vehicles in police work are a problem that requires a multidisciplinary approach. Their use in police work shows significant benefits in both the qualitative performance of tasks and the new opportunities that small unmanned aerial vehicles provide. They enable rapid data collection, surveillance of difficult-to-access areas, and documentation of events from an aerial perspective, which is why they have become a key tool for general police, traffic police, and criminal investigation services. We can conclude that their application is reflected in both preventive and repressive police work, from reporting incidents and collecting necessary data to searching the area, observing crimes and misdemeanors, and identifying their perpetrators.

Although there are certain limitations, such as weather conditions, battery life, and legal regulations, the experience of police services worldwide shows that the use of drones is justified and highly useful. Their regular use would require further improvement of the legal framework, staff training, and investments in technological infrastructure.

With advances in security and technology, drones should not be seen as a replacement for traditional police assets but as a valuable addition that improves operational efficiency. Their use contributes to faster response in emergencies, better monitoring of public order and traffic, and more efficient collection of evidence in criminal investigations.

The use of small unmanned aerial vehicles by the Ministry of the Interior of the Republic of Serbia would be a significant technical and technological breakthrough, primarily at the operational level of management. The authors believe that it is primarily necessary to legally regulate this area concerning the use of small unmanned aerial vehicles, in terms of misdemeanor and criminal liability, because the current Article 11 of the Law on Public Order and Peace, which defines the penal policy for the use of remotely controlled devices that endanger the safety of citizens or disrupt public order and peace, is insufficient. It is also necessary to legally regulate the use of small unmanned aerial vehicles by the Ministry of the Interior. The legal "gap" in their application to the Ministry of the Interior of the Republic of Serbia is reflected in the lack of a defined legal framework for their procurement and use, as well as for licensed personnel who would operate small unmanned aerial vehicles. Also, the question of the conditions for applying specific measures and actions to disable or capture other small unmanned aircraft in the airspace when necessary is raised. When regulating this matter, it is important to take into account human rights and the right to privacy protection, particularly in the part related to filming and photography carried out by technical means using unmanned aircraft. The Ministry of Interior should develop detailed operational guidelines and ethical standards for the use of small UAVs in policing, ensuring compliance with privacy and data protection laws. On the other hand, the the Serbian Parliament should amend the Law on Police to explicitly define the legal grounds for UAV deployment, establish oversight mechanisms, and mandate judicial authorization for surveillance outside emergency contexts. Both institutions should collaborate to create an independent supervisory body responsible for monitoring UAV use, ensuring transparency, and maintaining public trust.

In the coming years, with further technological development and better integration into police systems, unmanned aircraft will play an even greater role in maintaining citizens' safety and improving law enforcement.

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