PREGLEDNI ZNANSTVENI RAD (REVIEW ARTICLE)
UDK: 343.98

Boštjan Slak, MA.
Faculty of Criminal Justice and Security, Kotnikova 8,
1000 Ljubljana, Slovenia

DRONES IN (SLOVENE) CRIMINAL INVESTIGATION

Abstract

Unmanned aircrafts, also known as drones, are increasingly used in modern society. Their versatility allows them to be used in a range of different industries, sectors, spheres and activities, including in the area of policing and criminal investigation. In policing, drones are primarily used for the control of state borders, public events and traffic, while their use in criminal investigation is related all from assisting crime scene investigation to tracking suspects or criminal gangs. The most controversial issue pertaining to the use of drones for law enforcement (LE) tasks and purposes is related to privacy protection. Drones are extremely useful and effective in obtaining data, which raises strong concerns with respect to the potential abuse or excessive intrusion into individuals' privacy by the state. In the future, these issues will have to be addressed. Furthermore, a number of other issues also deserve an in-depth consideration by academics and criminal practitioners. These mostly refer to the way in which drones will be used for the commissioning of old and new crimes, and to the potential impacts on the forensically themed investigations of drones and their controllers.

Currently, discussions and solutions proposed to address such controversies are still at the level of individual countries, although (at least at the EU level) it is possible to observe the tendency to regulate these issues in the scope of international organisations. Slovenia is faced with a traditional problem, since the development of the legal basis is lagging behind the fast technological development. Criminal investigation professionals are aware of drones' versatility, however, the legislator has not yet granted the necessary powers to the Slovene Police for the use of such tools.

The paper describes some current use and potential future employability of drones in LE and certain issues that LE practitioners (may yet) encounter.

Keywords: *Drones, Unmanned Aircrafts, crime scene investigation, surveillance*

Drones, also known as unmanned aircrafts,[1] are becoming a daily reality of modern society. They appear in diverse roles through which they are not only becoming an integral part of social and technological environment (see Crotty, 2014; Finn & Wright, 2012; Perritt Jr. & Sprague, 2015; Sandbrook, 2015; Završnik, 2016a, 2016b on multiple roles that drones have in contemporary life), but also help in shaping the society itself.[2] Literature (Crotty, 2014; Fahlstrom & Gleason, 2012; Hayes, Jones, & Töpfer, 2014; Mendes de Leon & Scott, 2016) indicates that drones were primary developed for military purposes and only later entered commercial use. Their entry into the sphere of law enforcement (LE) was also gradual (ibid.). Even though aerial surveillance is nothing new in modern societies, it is not perceived to be as intrusive as surveillance with drones (Finn & Wright, 2012), which is understandable considering how smaller (insect) sized drones, their manoeuvrability, discreetness and other characteristics may be utilised for surveillance (see Clarke, 2014; Crotty, 2014; Jenks, 2015; U.S. Department of Justice Office of the Inspector General Audit Division, 2013; Završnik, 2016b). According to some authors, the size of drones affects the use of terminology. For instance, Perritt Jr. & Sprague (2015) speak of machodrones and microdrones. Microdrones ("sUAS" or small unmanned aircraft system in the terminology of the US Federal Aviation Administration) are in the scale of model helicopters, while machodrones are drones in the scale of airplanes. The present paper mostly discusses smaller scaled drones, primarily because "*machodrones"*

[1] The term "drone" is in this paper used as a synonym of Unmanned Aircraft (UA), Unmanned Aerial/Aircraft System (UAS), Remotely Piloted Aircraft System (RPAS), Remotely Operated Aircraft (ROA) and Remotely Piloted Aircraft (RPA), which is perhaps technically incorrect (Fahlstrom & Gleason, 2012) and there are authors that see a distinction (e.g. Jenks, 2015). However,even though aerial systems are usually most often identified with the term "drones" and are primarily discussed in this paper, it must be acknowledged that the term itself is, in some instances, also used for naval and land unmanned (robotic) vehicles (see also Hayes, Jones, & Töpfer, 2014; Jenks, 2015; Završnik, 2016b). This is also why this paper does not use the term UAS or any other term to describe a device/vehicle capable of flying. The term RPV (Remotely Piloted Vehicles)could perhaps also have been suitable.

[2] Undoubtedly, effects on society may be observed when drones are used to monitor protests, control public gatherings or even perform unauthorised recording of places (Clarke, 2014); on the other hand, they proved to be useful in the field of journalism (Clarke, 2014), state and corporation monitoring by NGOs (see Završnik, 2016a), search and rescue missions, employment in development, production, sale and application of drones, and creating the drone DIY (do-it-yourself) community (Clarke, 2014). The emergence of an ever greater number of documentaries, films, books, papers (Rao, Gopi, & Maione, 2016), art exhibitions, as well as the fact that human behaviour changed due to (adapted to) drone presence (Završnik, 2016) show that drones are becoming a regular subject of debate and an inspiration for an array of human behaviours.

are not yet widely available outside battlefield and counterterrorism spaces" (Perritt Jr. & Sprague, 2015, p. 677).[3]

Undoubtedly, the majority of tasks performed by drones in the field of LE are strongly related to surveillance. Drones can be used for traffic surveillance, tracking of suspects, crowd surveillance, crime detection, assistance in crime scene investigation, suspect monitoring and even when making arrests, since they may provide substantial tactical advantage in armed conflict situations. They can also be used for the rapid delivery of equipment, recording areas for criminal intelligence tasks, etc. (for (other) potential uses see Clarke, 2014; Crotty, 2014; Finn & Wright, 2012; Jenks, 2015; Murphy & Cycon, 1998; Završnik, 2016a). Drones may be used in every phase of criminal investigation and by various law enforcement agencies (LEAs) (Crotty, 2014). LEAs around the world are well aware of drones' capabilities and are therefore incorporating drones in their line of work. Some LEAs that are already using drones include the FBI (Lynch, 2013), police agencies in certain US states (Waddell, 2016). In addition, Salter (2014) lists new reports showing that the UK and Australian LEAs are also using drones, as are LEAs in Canada, the Netherlands, Switzerland and Germany (Finn & Wright, 2012).

The aim of this paper is to examine the potential use of drone technology for the purposes of criminal investigation. However, the paper also presents the implications of drones being used as a tool or target of crime, as this also affects the work of criminal investigation practitioners. Since certain policing and preventive measures (e.g. Sandbrook, 2015) coincide with criminal investigations, the use of drones is presented in a more general way. In doing so, the paper also protects certain investigative know-how, the publication of which would not be considered wise. The ideas related to drone usage for LE purposes described in this paper are supported by scientific and technical literature and on somewhat limited reports focusing on the use of drones in criminal investigation around the world.

1. Drones and criminal investigation

Information is the central focus of criminal investigation, while procedures applied in criminal investigation are aimed at detecting, gathering, interpreting and safeguarding information (see Innes, 2007) within the legal framework that is intended to safeguard individuals against the potential intrusiveness of the State apparatus. Information is thereon used to determine what has happened and who (if anyone) was responsible. If the examined behaviour is of criminal nature,

[3] However, in time and with greater technological advances,machodrones will be able to perform an array of LE and civil tasks. Perritt Jr. & Sprague (2015)describe that their increased size allows for the mounting of more equipment on/in the aircraft, thusenhancing their usability or extendingtheir mission purposes. Their paper also lists examples, such as delivering survival equipment, thermal imaging, etc.(ibid.).

the information obtained is then used for the prosecution of those responsible. Obtaining information is also at the core of the big data society to which drones are increasingly connected (see Završnik, 2016b). The use of drones in criminal investigation is therefore a natural development of using new technologies. There are two distinct roles that drones can play in a criminal investigation. Drones may be used as a tool for crime scene investigation and reconstruction (criminalistics)[4] or as a tool for conducting surveillance, where they are a useful instrument in intelligence-led policing/criminal intelligence, and improving the applicability of special investigative measures.

1.1. Drones and criminalistics

Drones are extensively useful for the tasks of crime scene investigation (Crotty, 2014; Jenks, 2015). We agree with Robinson (2010; 468) who states: *"Many times, having an image from a higher point of view than is normal can be extremely helpful. These images can supplement your normal natural perspective images in several situations. Aerial photos can be a great addition to your normal crime scene photography because higher views of the general area can show interrelationships between different locations much more effectively. Having a jury view the entire scene can make complex explanations of building relationships and travelled paths much easier to understand".* Therefore, even the basic drone's ability of visual recording can be extremely useful in crime scene investigation. In addition, the employment of additional sensors can further increase its usability. Drones are especially useful if the (crime scene) area is widespread (e.g. aircraft crashes), if the area under investigation could be potentially dangerous or hard to reach (e.g. fire and explosion scenes, toxic waste or chemical spills) (Murphy & Cycon, 1998), if the area demands a rapid response or is of complex nature (e.g. traffic accidents),[5] or if the area presents a combination of the aforementioned problematic elements. In comparison to helicopters or other aerial vehicles, drones can be used more speedily since they

[4] In Slovenia, the definition of criminal investigation follows the Central and Eastern Europe (CEE) distinction between criminalistics, criminal investigative tactics and methods of criminal investigation (Maver et al., 2004), where the term "criminalistics" is used to indicate a "*science of detecting, investigating and proving criminal acts and their perpetrators*" (Maver et al., 2004), while in the Western parts of the world the term "criminalistics" "*refers to specialists trained in recording, identifying and interpreting the minutiae (minute details) of physical evidence*" (Hess & Orthmann, 2010, p. 6). In the Western world, the term "criminal investigation" is used to denote "*the process of discovering, collecting, preparing, identifying and presenting evidence to determine what happened and who is responsible"*(Hess & Orthmann, 2010, p. 6). As such, its meaning is closer to the CEE use of the term criminalistics (Slovene "kriminalistika").In contrast, the Western classification does not differentiate between criminal investigation techniques, criminal investigative tactics and methods of criminal investigation.

[5] See a blog post from "Setting the Scene – Using Drones for Traffic Accident Reconstruction and Analysis" (2015), which discusses how drones can be used by experts for crash reconstruction. One useful feature of drones stems from their ability to record the area without the need to close down the road or endanger the personnel. They also enable the experts to quickly record tire markings, LEA marks, car debris, etc.

can be deployed from a trunk of a car (Crotty, 2014; Murphy & Cycon, 1998; Završnik, 2016b) or just simply thrown into the air (Fahlstrom & Gleason, 2012), thus shortening the flight procedure protocol and making the vehicle air born with less complexity. Since air displacement of smaller drones is not as high as that of helicopters, they can approach the crime scene at a closer range without potentially damaging the traces. Such manoeuvrability also enables the taking of visual footage or sensory information from different angles, since nearby objects represent smaller flight obstacles to drones that they would perhaps to helicopters (see Perritt Jr. & Sprague, 2015). If drones are equipped with more sensors, they can gather further data, such as potential air toxins or traces of burned or exploded materials (see Murphy & Cycon, 1998).

Infrared or thermal cameras may be used to analyse fire scenes, find decomposing bodies or other hidden objects (Ruffell, Pringle, & Forbes, 2014), etc. Yet, such cameras can be heavy (Perritt Jr. & Sprague, 2015), which is why they may represent a challenging engineering issue or affect the flight time (since increased weight demands more power). Equipping drones with laser-based metering devices may also be useful. In the future,drones will most probably be equipped with 3D cameras for crime scene recording and later-on computer generated reconstructions. An open source software that can render 3D images from aerial photographs can already be used as an alternative (Spranger, Heinke, Becker, & Labudde, 2016). Because drones are strongly reliant on the global positioning system (GPS) technology, flight path logs (in combination with Geotagging) can be very useful in trials, as this can increase the credibility of recorded crime scene footage of traces. Since "*the concept of 'bringing the laboratory' to the scene has been around for some time now both in theoretical proposal and technological development"*(Roux, Talbot-Wright, Robertson, Crispino, & Ribaux, 2015; 5), it is expected that drones will further stimulate such course of action, as they can provide an excellent platform for mobile laboratory technology. Roux et al. (2015) also discuss the new tendencies of bringing forensic scientists to the scene of the crime more often and the tendencies to perform more analyses nearer the scene of the crime, thus providing the required feedback much faster. Yet, there are certain limitations, such as the possible dangers on individual sites (potential armed suspects, presence of explosives, etc.), logistic issues (driving from laboratories to the scene of the crime, multiple crime scenes, etc.), equipment issues (not all laboratory equipment can be downsized in order to make it more practical for transportation, inadequate internet connection, the need for larger screens, etc., which are more accessible in laboratories). In such cases, drones can provide a link between forensic laboratories (and experts) and crime scene technicians, detectives present on the spot and the coordinating body. Drones expand the monitoring capabilities of personal body cameras and provide a better overview of the scene to the experts and analysts, who are in turn able to give better advice and real-time directions to the personnel on the scene.

The development in the field of drones' use was evidenced by Finn & Wright (2012), who gathered several news reports to substantiate their paper, demonstrated that Canada is already using drones for crime scene investigation and data from drones are being used in court proceedings.

1.2. Drones as a tool for surveillance and criminal intelligence tasks

The primary use of drones is connected to surveillance and data generated by it. The general surveillance of an area is not a task of criminal investigators as such, it is however part of intelligence-led policing, which relies heavily on criminal intelligence (John & Maguire, 2007; Newburn & Reiner, 2012) and can in turn benefit greatly from data that are obtained through the use of drones. General and citywide monitoring of areas (see Andrejevic (2016) for examples of such grand scale surveillance experiments and tasks) can firstly be used as a deterrence factor (similar to the CCTV systems); secondly, it may allow for a potentially faster detection and response to crimes; thirdly, it may generate an abundance of data about the manner in which a criminal offence was committed; and lastly, it may be used as evidence in court proceedings. The same level of usefulness of drone footage also applies in smaller scale surveillance. The aerial recognisance missions performed by drones are also a method of detecting crimes, such as illegal immigration, drug production/possessing, various trafficking offences (Kelly & Kelly, 2014), crimes against the environment, poaching, illegal logging, etc. (Sandbrook, 2015). Infrared cameras mounted on drones are used in the search and rescue of missing person or fleeing suspects or in detecting hidden marihuana laboratories (Finn & Wright, 2012).

The combination of facial recognition technology that drones, albeit usually only machodrones, already incorporate (Perritt Jr. & Sprague, 2015)with the CCTV data and on-the-scene CCTV analyses (Roux et al., 2015) can provide real time crowd analysis and potential suspect spotting.

Furthermore, special investigative measures (undercover operations, use of wiretaps and similar devices) can be greatly improved by using drones. The smaller insect-sized and shaped drones (Jenks, 2015; Završnik, 2016b) can be easily used to listen to criminal groups, terrorist cells, etc., while larger drones can be used to safely oversee officers involved in undercover operations or to safely follow suspect(s) or person(s) of interest. Drones can be used to follow a suspect driving a vehicle by employing the "smart" vision technology, specific frequency or by any other target tagging method[6](Završnik, 2016b). Using a

[6] Završnik (2016; 5) provides an excellent example: "*The police could, for instance, use a stingray—which simulates a cell phone tower in order to trick nearby mobile devices into connecting to it and revealing their location—and attach it to a drone. It is only a matter of degree and economic rationale to nudge the idea into reality (e.g. Cessna planes are already used for such purposes).*" A similar approach could be used to track missing persons. For instance, by providing a drone or a swamp of drones with data on the missing person's clothes, telephone

drone for tracking a person of interest is easier, as there is less chance of spotting a "tail", as well as faster and less costly in comparison with a helicopter or a small plane.[7] Cameras, which can be mounted on aerial vehicles and enable the tracking of several targets at once ("US Army unveils 1.8 gigapixel camera helicopter drone - BBC News," 2012), are already in use.

Finally, for the purpose of intelligence-led policing and/or criminal intelligence data accumulated by drones can be used for event planning (Robinson, 2010) in a wide array of circumstances, such as examining a marathon route, monitoring high profile political/state visits or potential armed conflict situations (situations involving hostages or cases when armed suspects are barracked).[8] In addition, criminal hotspot monitoring is less costly when using drones and less intrusive for the residents.

2. Drones as targets and tools of crime or causes of accidents

On the other hand, drones can be used in all forms of unlawful surveillance, voyeuristic crimes, illegal deliveries (for instance to prison inmates), facilitating property crimes (navigating drones through the windows and using them to open doors),[9] etc. (Horsman, 2016). Secondly, a drone malfunction (which according to

data, smartwatch data, etc. and releasing them in a certain area. By using autonomous flight programmes,such an approach can yield even better results. "*A drone assigned to a search-and-rescue mission could be automatically programmed to fly a standard search grid. In either case, the [Drone Operator] and systems operator could concentrate their energies on looking for anomalous situations that might indicate the target of a search effort or criminal activity rather than flying the aircraft*." (Perritt Jr. & Sprague, 2015, p. 689). Pre-programmed flights can also be used for properly capturing aerial visual data that can later be used for the reconstruction of crime or accident scenes (Spranger, Heinke, Becker, & Labudde, 2016).

[7] As stated by theU.S. Department of Justice Office of the Inspector General Audit Division (2013; 3), "*Small UAS provide an attractive alternative to law enforcement agencies seeking to establish or augment their aviation capabilities because small UAS have much lower operational and maintenance costs than the manned aircraft typically used by law enforcement. One local law enforcement agency has estimated the cost of using a UAS at just $25 per hour compared to $650 per hour for a manned aircraft*".

[8] It is not only the information and data that drones provide in crises and dangerous situations,but also the fact that drones themselvesmay be used to defuse the situation if, for instance, they are equipped with a (non)lethal weapons system. Equipping police drones with such systems is a much debated issue (Sandvik, 2016). When considering the increasing trend of police militarisation in some countries, predominantly in the USA (Kappeler & Kraska, 2015; Salter, 2014),drones with (non)lethal payloads will most probably become a reality (see also Finn & Wright, 2012). The 2016 shooting of Dallas police officers, where the police used a bomb-disposal robot to kill the suspect (Thielman, 2016), which was extensively covered by the media, will probably trigger similar deployment tactics and encourage drone use for such purposes. See Salter (2014), Sandvik (2016) and Straub (2014) for numerous other possibilities for the use of drones equipped with (non)lethal weapons systems by LEAs and issues that must be considered when/if these are used.

[9] Some areas (such as airports) already use anti-drone technology (Clarke, 2014) and some drones are already programmed in such a way that makes flying in the proximity of a restricted area impossible (Završnik, 2016a). What does this mean for criminal investigation? Firstly,with respect to intelligence-led policing and criminal intelligence such possibilities must be incorporated in preventive strategies, when producing security or threat assessments/reports and countermeasures. Secondly, if anti-drone technology is used in an area and crime is nevertheless committed with the help of a drone, proper forensic and criminal investigative analyses must be

"Drone Crash Database" (2016) is not at all rare) may cause damage or even fatal injuries (Clarke, 2014), thus causing situations that demand criminal investigations into the responsibility and the identification of the reason(s) behind the accident. Thirdly, cases of unauthorised or inappropriate drone use may present a violation of (aviation) laws (see Horsman, 2016). If a drone collides with a passenger plane, consequences may be catastrophic (Rao, Gopi, & Maione, 2016). Mendes de Leon & Scott (2016), for instance, describe a military example where the control of an US military drone was overtaken by Iranian forces. McDougal (2013) also describes a case where a university professor and his students managed to gain control of an US LE drone. Such actions present numerous imminent threats (such as the application and use of weapons on the drones against others, using reverse engineering for gaining access to technological know-how, gaining access to information captured by drones[10](Sandbrook, 2015), etc.). In civil cases, where wireless and Bluetooth technology, which is perhaps even less protected, is used for controlling drones, such overtake could be even easier. This indicates that there are and will be even more cases where drones are/will be targets of crime. One can imagine that drones will be increasingly targeted if Amazon and other merchants materialise their idea of using drones for delivery (Clarke, 2014; Perritt Jr. & Sprague, 2015; Rao et al., 2016; Završnik, 2016b) or if drones are used for spotting wildlife poachers (Sandbrook, 2015) either by the use of brute force (albeit risking the damage to transported goods) or by the IT where drones can be electronically overtaken and navigated together with the goods they carry into the hands of the perpetrators. There will also be cases where the perpetrators will (or already have) equip drones with weapons and explosives and use them for committing crimes (Clarke, 2014) or to move goods to/from restricted areas, such as prison delivery or ransom demands (Clarke, 2014; Horsman, 2016; Završnik, 2016a).

In all of the cases listed above, data from drones and their controllers represent some sort of evidence (Horsman, 2016; see also his paper for some basic/exemplary procedural guidelines on how to perform forensic investigations on drones).

conducted in order to find the reason for the failure of anti-drone technology. When investigators develop the initial versions of such crimes, they must consider sabotage or inside-help. Also, the level of expertise for someone hacking/cracking the anti-drone technology is an indicator of the perpetrator's skills (or that he/she bought such knowledge). In the future, if news agencies obtain an authorisation to fly drones in high-security areas (diplomatic visits, political events), the LEAs will have an onerous task in trying to distinguish news agencies' drones from potentially dangerous ones (see also Clarke, 2014).

[10] See Goodman (2013) for further examples.

Apart from the legal setbacks related to accessing data that could present evidence, Horsman, (2016) also lists several forensic challenges (e.g. the acquisition of data from drones can be problematic if there is a lack of suitable ports, establishing flight data is important, but can be problematic if there is an absence of the GPS hardware on the drone, establishing ownership,[11] etc.) that could pose a problem until proper tools and procedures are not fully developed.

3. Problems related to the application of drones in criminal investigation or to cases when they are subject of an investigation

Apart from normal engineering difficulties, such as controlling and transferring frequencies in populated areas, as well as backup protocols in case of loss of communication between a drone and its operator (see Perritt Jr. & Sprague, 2015),[12] the privacy issues represent the most prominent concerns when it comes to the use of drones (see Andrejevic, 2016; Clarke, 2014; Finn & Wright, 2012; Jenks, 2015; Perritt Jr. & Sprague, 2015; Straub, 2014; Završnik, 2016b). The general public also express reservations regarding the use of drones in urban areas and in the field of LE due to a strong perceptual connotation involving deadly military use of drones, (Hayes et al., 2014; Jenks, 2015; Perritt Jr. & Sprague, 2015; Salter, 2014; Sandbrook, 2015). Even though drones enable LE to gather data in manners similar to those that were possible in the past (air reconnaissance, wiretapping), there are small, yet crucial differences in these approaches. Drones facilitate the actual technical gathering of information. Even if not that long ago, installing listening devices was a risky operation, nowadays, a small sized drone can "deliver" a listening device through an open window, an air shaft, a

[11] It is easy to imagine a situation where the used drone(s) will be abandoned (e.g. technical errors occurred during crime commission). Tracing the owner and linking the user/operator will be a priority, which will, apart from electronic data, requirethe use of validated criminal investigation and forensic methods, such as fingerprint or DNA comparison,(Horsman, 2016). In cases where the registration of drones will be mandatory there will be an increased demand for the identification of owners/operators and for proving the violation of law. In turn, this – if an LEA will be asked to perform such investigations – willincrease the workload of officers and forensic experts having such expertise. See also Mendes de Leon & Scott (2016) for a description of the *UK CAA* v *Robert Knowles*case, in which a man was trialled in the UK for the improper drone use and where an unclaimed drone found near a UK nuclear submarine testing site was traced back to its owner.

[12] Though it is reasonable to consider that a vast majority of drones used for LE tasks will be employed in the so-called line-of-site, where operators see the drone and use on-board cameras for non-navigational purposes, there can be instances where the controlling signal is lost or jammed or cases of energy depletion or technical errors. In such cases, the drone should be programmed to fly/navigate to a proper location and not simply land where it is currently located. Such landing or dropdown in the event of loss of energy can contaminate a crime scene or even represent a threat to the safety of persons in its proximity. Some drones are already programmed to fly back to the launching point in case of lost control link (Perritt Jr. & Sprague, 2015). Perritt Jr. & Sprague (2015) also provide an excellent overview of the current development in drone technology and setbacks present in the technology, as well as potential implications for the use of drones in LE. This, of course,demonstrates that drones that are to be used in LE need to have certain characteristics, which in turn increase their price.

chimney or "slip" it through the door. Such advances indicate the potential for greater intrusiveness (Finn & Wright, 2012; Perritt Jr. & Sprague, 2015) into the privacy of individuals. States are therefore presented with a task of deciding what this actually means for their current criminal procedure legislation.[13] Since the technology is still relatively new, LE agents and officers are not accustomed to it. Therefore, they do not "think of it" when encountering certain situations or they apply it in an unsuitable manner (McDougal, 2013). As with most new technology, legislative issues are complemented by financing issues (Custers & Vergouw, 2015) when it comes to the use of drones. Salter (2014) even argues that due to the advanced technology, insurance issues, complexity, etc. and the lack of proper empirical data regarding the efficiency of drones, one cannot simply state that drones are less costly and more effective than traditional aircrafts (see also Rao, Gopi, & Maione (2016) or McDougal (2013) on a similar note). Strong lobbying groups can, to some degree, be accredited to promote "efficient" drone use outside the military sphere (Hayes et al., 2014). In fear of feeling redundant, helicopter and manned aircraft pilots will probably voice some concerns, however, it must be stressed that, in fact, pilots will still be needed due to their expertise (Perritt Jr. & Sprague, 2015) and perhaps even more so due to an increase in aerial themed tasks. Those who will be tasked to fly/drive drones will, however, need adequate training. Flying/navigating around a complex crime scene without proper training and familiarity with an unmanned system/device may have significant negative consequences. The lack of funding and knowledge when it comes to drones may also require LEA to outsource some tasks. All this is fully in line with Završnik's (2016; 5) thought, which reads: "*Law enforcement drones disclose another two shifts in the security domain—a shift towards private or "for-profit" policing and a shift towards "preventive" justice.*".

On the other side of the spectrum, there is an insufficient legislative framework that would regulate cases, in which drones are tools or targets of crime (see Mendes de Leon & Scott, 2016). In many cases, the useful evidence for the investigation of such crimes may be found on smart devices which are used for control and navigation (see Horsman, 2016; Perritt Jr. & Sprague, 2015) and which are heavily protected by privacy laws in most countries. According to Mendes de Leon and Scott (2016), the 2010 Beijing Convention provides useful legal instruments for such issues, yet its implementation seems to stagnate. Secondly, experts will need to educate themselves with regard to obtaining such data from devices, while adequate hardware and software will need to be developed and bought by forensic laboratories. Subsequently, this will represent a burden for the budget of LEAs. However, this will increase the demand for labour in the field of drone technology.

[13] For instance, see Crotty (2014), Finn & Wright (2012) in Jenks (2015)on how the US and other countries deal with such issues and Hayes, Jones, & Töpfer (2014) for a brief legislative and development history on the use of drones in the EU.

One must also ask oneself how the ever more widespread use of drones would affect ordinary day-to-day policing? Will "officers on the beat" need to monitor the sky, as well? And since drones will be used for crime commission, how will LEAs cope with such attempts. Various ((non)technological) means are developed to stop drones in-flight (Hayes et al., 2014). However, will officers need to be trained and equipped with them? And what does this mean in the ever increasing (Newburn & Reiner, 2012) world of plural policing? Does the legislation in the field of municipal wardens and private security personnel regulate such task and situations?

4. Drones' use in Slovenia

The Slovene legislation regulating the use of drones[14] was poor and underdeveloped even by the end of 2015, which meant that legislation governing the use of ultra light aircraft also applied to drones ("Droni v akciji," 2015). In early 2016, the Safety Directive on Unmanned Aircraft adopted by the Republic of Slovenia Civil Aviation Agency (2016; hereon the Agency) substantially limited the (non)profit drone use and actually grounded almost all drones.[15] Due to stakeholders' response to the directive, which used the financial loss, where possible, as a prevailing argument, the Slovene legislator passed an adopted the "Decree of Unmanned Aircraft Systems [Uredba o sistemih brezpilotnih zrakoplovov]," (2016; hereafter the Decree). The Decree now properly governs (and actually allows) the use of unmanned aircrafts and classifies them in terms of their weight (the Decree is applicable to drones weighing between 500 grams (if no aviation activities are performed) and 150 kilograms). It also more properly classifies flight zones (four zones with respect to the (non)presence of population and infrastructure) and introduces risk categories (amalgamate flight zones and drone weight). All drones need to be equipped with identifying information

[14] There are typical terminological issues with regard to the translation of drone technology terminology into the Slovene language (see "Brezpilotni letalnik," 2015). Even though it was recommended to use the term "*brezpilotniletalnik*" (ibid.) and legislator and several official documents (e.g. "Decree of Unmanned Aircraft Systems [Uredba o sistemih brezpilotnih zrakoplovov]," 2016; the Republic of Slovenia Civil Aviation Agency'sSafety Directive on Unmanned Aircraft, 2016) follow the recommendations to a certain extent, the term "*drone*" is, in fact, widespread and most frequently used.

[15] As quoted in the Safety Directive on Unmanned Aircraft: "*The following shall be prohibited: Conducting services with unmanned aircraft, whereby conducting services means the utilisation of an unmanned aircraft in aerial activities either against payment or free of charge (such asaerial photography, aerial advertising, aerial surveillance, fire protection, avalanche launch, scientific research flights, television, movie and news flights, special events flights, including flying displays, competition flights and similar);*
Unmanned aircraft flights in Class III area of operation: area with buildings or facilities primarily intended for residential, business or recreational purposes (residential buildings and houses, schools, offices, sports facilities, parks, etc.), or in an area featuring civil engineering constructions where people are present (motorways etc.), and in Class IV area of operation: urban zone area (centre of towns or other settlements)."(Republic of Slovenia Civil Aviation Agency, 2016, p. 4).

stickers or plates. The Decree also requires the insurance of drones and, in case of flying with first person view system (e.g. navigating via camera(s) attached to drones), an associate observer,[16] whose task is to maintain a visual contact with the drone, must be present. Nevertheless, there are some exceptions to this demand. The most important aspect of the Decree is that flights need to be reported (announced) to the Republic of Slovenia Civil Aviation Agency in order to obtain flight permission. For certain categories, obtaining special flight licences from the Agency is also required ("Decree", 2016). While the Decree is a great step forward, drone sellers and users still believe there are certain shortcomings and await the potential unification of the EU legislation (Rožman, 2016). Furthermore, the Decree is not applicable to police and other state actors: "*the provisions of this Decree shall not apply to systems of unmanned aircraft used for carrying out military, customs, police, search, rescue and fire-fighting exercises, coastguard or similar activities*" (Article 1(3) of the "Decree", 2016).[17] The use of drones by state actors is regulated by other laws. With respect to the police, the future Act Amending the Police Tasks and Powers Act plans to incorporate drones in the Slovene Police ("Pri pripravi sprememb Zakona o nalogah in pooblastilih policije sledimo kakovostni in argumentirani razpravi," 2016). However, the Information Commissioner of the Republic of Slovenia [Informacijskipooblaščenec] presented some substantial comments and recommendations. In its opinion, the Police may use drones for tasks (and with technology) for which it already has appropriate legislative powers. It also suggests the implementation of proper revision protocols and assessment regarding the use of drones, and recommends that court documents include notes indicating that information was obtained by using a drone (Informacijski pooblaščenec, 2015). The Slovene Police recognises the potential that drones have in searching for missing persons, crowd supervision, crime scene and traffic accident investigations, border control and transnational crimes, as well as for special investigation measures (Felc, 2016). It does not, however, aspire towards overall surveillance of traffic or other areas ("Pri pripravi sprememb Zakona o nalogah in pooblastilih policije sledimo kakovostni in argumentirani razpravi," 2016). In 2016, the Slovene Police bought two drones, however, since police and civil legislation was not modernised to incorporate the use of drones, the Police are not allowed to use them (Felc, 2016). On the other hand, the Slovene Army had already received one of few drones it intended to buy and is now using it for education and training purposes. In addition, it intends to lend its drones to the Administration for Civil Protection and Disaster Relief ("Slovenska vojska je kupila prvo brezpilotno letalo," 2016). The Army also intends to use drones

[16] Since no official translation of the Decree has been made available so far, the termswere translated by the author of this paper. Therefore, some discrepancies may appear in future similar texts.

[17] However, the Decree (2016) does demand that the technical rules of the flight described in its articles are nevertheless respected by state actors.

for border patrol (ibid.). Since some police powers were recently awarded to the armed forces in response to the migration crisis (see "Droni v akciji," 2015), this will further contribute to the chaotic (legislative) state-of-play pertaining to the use of drones in Slovenia.

As an EU member, Slovenia must guarantee that its legislation be harmonised with EU standards, which are also lagging behind ("Droni v akciji," 2015). The problem is rather substantial in its nature, since the use of drones is being globally seriously considered in terms of broader supervision (Finn &Wright, 2012; Hayes et al., 2014; Završnik, 2016b) and Slovene, as well as other South Schengen/EU borders are under pressure due to the latest extensive migration flows. In addition, if other countries incorporate drones into LE, and the Slovene legislation is not harmonised, evidence obtained through the use of drones will not be admissible in Slovene courts. Slovenia advocates and stipulates higher protection of human rights (Maver, 2000; Selinšek, 2015) is well on course to develop legislation which will limit the degree of evidence obtained by drones. Furthermore, Slovenia and its (LE) agencies are already faced with cases involving drones being shot down from the sky, etc. ("Droni v akciji," 2015). While the Decree (2016) penalises some unregulated drone use, the Agency inspectors are responsible for monitoring compliance with legislation. The Police only acts if drones are causing general danger ("Agencija vzpostavila postopke pridobivanja dovoljenj za letenje z droni," 2016) or if their use causes the violation of privacy due to unlawful recording (Megla, 2015). According to a survey conducted by GfKSlovenija, such violations are also one of the most serious fears expressed by the Slovene public with respect to drone use. While the public support the use of drones at public events and for border patrols (Gornik, 2016), they believe that drones are a tool for the surveillance of contemporary society (ibid.).

5. Conclusions

We agree with Sandvik (2016; 50) who states that "*drones are increasingly likely to have been designed, manufactured, and exported from such countries, as domestic drone industries evolve and mature…..//… a future deployment of weaponized public order drones* ***anywhere****can lead to the normalization and legitimization of such uses in Western liberal democracies*" (emphasised in the original text). This means that the legislative framework and the "normalisation" of drone use will be lagging behind for quite some time.[18] Even in the USA, where the use of drones is most widespread and has the longest tradition, there are some substantial legal issues that will need to be discussed in the future. Some of them result from diverging opinion on the (non)permissiveness of drone use (see Crotty, 2014; Finn & Wright, 2012; Jenks, 2015). Slovenia and other EU

[18] The demand for the use of drones will not merely normalise their application, but also fuel the technological research and development of drones and equipment that can be mounted on them (Perritt Jr. & Sprague, 2015).

states (Mendes de Leon & Scott, 2016) will have to accelerate the debate on the issue. Furthermore, it is not merely the legislation concerning the use of drones in LE but also the legislation for investigating drones and their controlling devices that will need to be developed. On the basis of currently applicable legislation, one can only image the abundance of legislative procedural problems that would arise if a drone controlled by a smart phone would be used for committing a crime. It is possible that the recent social (migration) and security treats (a series of terrorist attacks in France, Germany and Belgium) will have a favourable impact on the surveillance and use of drones. The fact that everything that drones are able to do is already permitted and achievable by other means and services is perhaps the most supportive claim in favour of drone use. Yet, these are costly and time demanding. Many technological advances which are used by LE today encountered similar setbacks (Jenks, 2015). The study conducted by Custers and Vergouw (2015) shows that drones rapidly entered the "wish list" of different countries' LEAs. While Custers and Vergouw (2015) emphasise that LEAs should inform the public about the way in which specific technology helped them in their work, thus influencing public perception (see also Sandbrook, 2015) or gain more finances for technology, sharing such information is dangerous, as it also informs the criminals. Drones, having a negative surveillance connotation, will perhaps find it even more difficult to acquire funding and support. We see the use of drones in criminal investigation as inevitable and therefore suggest that an appropriate development of the legislation and technology begin as soon as possible. This should be backed by proper research (which is, at least in the EU, already extensively financed and demanded (Hayes et al., 2014)). Critical papers, such as Salter's (2014),[19] point to important issues that need to be examined (such as the adequate evaluation of drone effectiveness and the cost of its use). Research teams composed of forensic experts, engineering experts and criminal procedure practitioners who develop new systems for drones should became a reality, as this would benefit both the LE as well as criminal investigation, forensic andengineering sciences.

REFERENCES

1. Agencija vzpostavila postopke pridobivanja dovoljenj za letenje z droni. (2016, August 18). Retrieved from https://krog.sta.si/2294961/agencija-vzpostavila-postopke-pridobivanja-dovoljenj-za-letenje-z-droni
2. Andrejevic, M. (2016). Theorizing drones and droning theory. In A. Završnik (Ed.), Drones and Unmanned Aerial Systems (pp. 21–43). Cham: Springer International Publishing.

[19] Furthermore, see the works of Hayes et al.(2014) and Rao et al. (2016).

3. Brezpilotni letalnik. (2015). Retrieved from http://isjfr.zrc-sazu.si/sl/terminologisce/svetovanje/brezpilotni-letalnik
4. Clarke, R. (2014). Understanding the drone epidemic. Computer Law & Security Review, 30(3), 230–246.
5. Crotty, S. (2014). The aerial dragnet: A drone-ing need for fourth amendment change. *Valparaiso University Law Review*, *49*(1), 219–265.
6. Custers, B., & Vergouw, B. (2015). Promising policing technologies: Experiences, obstacles and police needs regarding law enforcement technologies. *Computer Law & Security Review*, *31*(4), 518–526.
7. Decree of Unmanned Aircraft Systems [Uredba o sistemih brezpilotnih zrakoplovov]. (2016). *Uradni List RS*, (52/16).
8. Drone Crash Database. (2016). Retrieved from https://dronewars.net/drone-crash-database/
9. Droni v akciji. (2015). *Val 202*. Retrieved from http://val202.rtvslo.si/2015/11/reakcija-17/
10. Fahlstrom, P. G., & Gleason, T. J. (2012). *Introduction to UAV systems* (4th ed). Chichester, West Sussex: John Wiley & Sons.
11. Felc, M. (2016). Policija nabavila dva drona, a sta zaradi birokracije na tleh. Retrieved from http://www.delo.si/novice/kronika/vse-bolj-nujna-v-zraku-a-sta-zaradi-birokracije-na-tleh.html
12. Finn, R. L., & Wright, D. (2012). Unmanned aircraft systems: Surveillance, ethics and privacy in civil applications. *Computer Law & Security Review*, *28*(2), 184–194.
13. Goodman, M. (2013). Criminals and terrorists can fly drones too. *Time*. Retrieved from http://ideas.time.com/2013/01/31/criminals-and-terrorists-can-fly-drones-too/
14. Gornik, M. (2016). Izjemen tehnološki potencial ali grožnja zasebnosti? GfK Orange. Retrieved from http://www.gfkorange.si/2016/03/29/izjemen-tehnoloski-potencial-ali-groznja-zasebnosti/
15. Hayes, B., Jones, C., & Töpfer, E. (2014). *Eurodrones Inc*. Transnational Institute (TNI) & Statewatch. Retrieved from http://www.statewatch.org/news/2014/feb/sw-tni-eurodrones-inc-feb-2014.pdf
16. Hess, K. M., & Orthmann, C. M. H. (2010). *Criminal investigation*. Clifton Park, NY: Delmar, Cengage Learning.
17. Horsman, G. (2016). Unmanned aerial vehicles: A preliminary analysis of forensic challenges. *Digital Investigation*, *16*, 1–11.
18. Informacijski pooblaščenec. (2015). *Brezpilotni letalniki - poročilo Informacijskega pooblaščenca*. Retrieved from https://www.ip-rs.si/fileadmin/user_upload/Pdf/porocila/Brezpilotni_letalniki_-_porocilo_IP.pdf

19. Innes, M. (2007). Investigation order and major crime inquiries. In T. Newburn, T. Williamson, & A. Wright (Eds.), *Handbook of criminal investigation.* (p. 255). Cullompton: Willan Pub.
20. Jenks, C. (2015). State labs of federalism and law enforcement "Drone" Use. *Washington and Lee Law Review*, *72*(3), 1389–1431.
21. John, T., & Maguire, M. (2007). Criminal intelligence and the National Intelligence Model. In T. Newburn, T. Williamson, & A. Wright (Eds.), *Handbook of Criminal Investigation* (pp. 199–225). Cullompton: Willan Publishing Ltd.
22. Kappeler, V. E., & Kraska, P. B. (2015). Normalising police militarisation, living in denial. *Policing and Society*, *25*(3), 268–275.
23. Kelly, A., & Kelly, N. (2014). Validating the Remotely Sensed Geography of Crime: A Review of Emerging Issues. *Remote Sensing*, *6*(12), 12723–12751.
24. Lynch, J. (2013, June 20). Why Won't the FBI Tell the Public About its Drone Program? Retrieved from https://www.eff.org/deeplinks/2013/06/why-wont-fbi-tell-public-about-its-drone-program
25. Maver, D. (2000). Tipične obrambne strategije in strategije preiskovanja. *Revija za kriminalistiko in kriminologijo*, *51*(1), 12–23.
26. Maver et al., D. (2004). *Kriminalistika: uvod, taktika, tehnika*. Ljubljana: Uradni list Republike Slovenije.
27. McDougal, C. (2013). From the battlefield to domestic airspace: An analysis of the evolving roles and expectations of drone technology. *PublicINReview*, *1*(2), 92–102.
28. Megla, M. (2015). Veste, kaj snemajo droni, ko letijo nad nami? Retrieved from http://www.delo.si/novice/slovenija/veste-kaj-snemajo-droni-ko-letijo-nad-nami.html
29. Mendes de Leon, P., & Scott, B. I. (2016). An analysis of Unmanned Aircraft Systems under air law. In A. Završnik (Ed.), *Drones and Unmanned Aerial Systems* (pp. 185–213). Cham: Springer International Publishing.
30. Murphy, D., & Cycon, J. (1998). *Applications for mini VTOL UAV for law enforcement*. Space and Naval Warfare Systems Center San Diego, CA 92152-7383.
31. Newburn, T., & Reiner, R. (2012). Policing and the Police. In M. Maguire, R. Morgan, & R. Reiner (Eds.), *The Oxford handbook of criminology* (pp. 806–837). Oxford University Press.
32. Perritt Jr., H. H., & Sprague, E. O. (2015). Drones. *Vanderbilt Journal of Entertainment & Technology Law*, *17*(3), 673–749.
33. Pri pripravi sprememb Zakona o nalogah in pooblastilih policije sledimo kakovostni in argumentirani razpravi. (2016, 8). Retrieved from http://www.mnz.gov.si/si/novinarsko_sredisce/novica/article/12137/9832/

34. Rao, B., Gopi, A. G., & Maione, R. (2016). The societal impact of commercial drones. *Technology in Society*, *45*, 83–90.
35. Republic of Slovenia Civil Aviation Agency. Safety Directive on Unmanned Aircraft (2016). Retrieved from http://www.caa.si/fileadmin/user_upload/pageuploads/Slike/Agencija/Safety_Directive_on_Unmanned_Aircraft2016.pdf
36. Robinson, E. M. (2010). *Crime scene photography* (2nd ed). Amsterdam; Boston: Academic Press/Elsevier.
37. Roux, C., Talbot-Wright, B., Robertson, J., Crispino, F., & Ribaux, O. (2015). The end of the (forensic science) world as we know it? The example of trace evidence. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *370*(1674), 20140260.
38. Rožman, A. (2016, August 18). Brezpilotni zrakoplovi: Nova uredba omogoča snemanje z brezpilotniki. Retrieved from https://www.dnevnik.si/1042748569
39. Ruffell, A., Pringle, J. K., & Forbes, S. (2014). Search protocols for hidden forensic objects beneath floors and within walls. *Forensic Science International*, *237*, 137–145.
40. Salter, M. (2014). Toys for the Boys? Drones, pleasure and popular culture in the militarisation of policing. *Critical Criminology*, *22*(2), 163–177.
41. Sandbrook, C. (2015). The social implications of using drones for biodiversity conservation. *Ambio*, *44*(S4), 636–647.
42. Sandvik, K. B. (2016). The political and moral economies of dual technology transfers: Arming police drones. In A. Završnik (Ed.), *Drones and Unmanned Aerial Systems* (pp. 45–66). Cham: Springer International Publishing.
43. Selinšek, L. (2015). Izločitev dokazov v kazenskem postopku: (primerjalnopravni pregled). *Pravna Praksa*, *34*(28), I–VI.
44. Setting the scene – using drones for traffic accident reconstruction and analysis. (2015). Retrieved from http://waypoint.sensefly.com/setting-the-scene-using-drones-for-crash-reconstruction-and-analysis/
45. Slovenska vojska je kupila prvo brezpilotno letalo. (2016, July 13). Retrieved from http://www.rtvslo.si/slovenija/slovenska-vojska-je-kupila-prvo-brezpilotno-letalo/398052
46. Spranger, M., Heinke, F., Becker, S., & Labudde, D. (2016). Towards drone-assisted large-scale disaster response and recovery (pp. 5–10). Presented at the ACCSE 2016 : The First International Conference on Advances in Computation, Communications and Services, Valencia, Spain: IARIA.

47. Straub, J. (2014). Unmanned Aerial Systems: Consideration of the use of force for law enforcement applications. *Technology in Society*, *39*, 100–109.
48. Thielman, S. (2016, July 8). Use of police robot to kill Dallas shooting suspect believed to be first in US history. *The Guardian*. Retrieved from https://www.theguardian.com/technology/2016/jul/08/police-bomb-robot-explosive-killed-suspect-dallas
49. US Army unveils 1.8 gigapixel camera helicopter drone - BBC News. (2012). Retrieved from http://www.bbc.com/news/technology-16358851
50. U.S. Department of Justice Office of the Inspector General Audit Division. (2013). *Interim Report on the Department of Justice's Use and Support of Unmanned Aircraft Systems* (No. 13–37) (p. 43). Retrieved from https://oig.justice.gov/reports/2013/a1337.pdf
51. Waddell, K. (2016, February 5). Few privacy limitations exist on how police use drones. Retrieved from /politics/archive/2015/02/few-privacy-limitations-exist-on-how-police-use-drones/458583/
52. Završnik, A. (2016a). Drones, resistance and countersurveillance. In A. Završnik (Ed.), *Drones and Unmanned Aerial Systems* (pp. 243–266). Cham: Springer International Publishing.
53. Završnik, A. (2016b). Introduction: Situating drones in surveillance societies. In A. Završnik (Ed.), *Drones and Unmanned Aerial Systems* (pp. 1–18). Cham: Springer International Publishing.

SUMMARY

DRONI V (SLOVENSKI) KRIMINALISTIKI

Brezpilotna letala oziroma t. i. droni intenzivno vstopajo v sodobno družbo. Njihova vsestranska uporaba je izkoriščena v paleti različnih panog, področji, sfer in dejavnosti. Med drugim tudi na področju policijske in kriminalistične dejavnosti. Pri policijski dejavnosti se predvsem uporabljajo za nadzor državnih mej, javnih prireditev in prometa, znotraj kriminalistike pa se drone lahko uporabi vse od pomoči pri ogledu kraja dejanja do sledenja osumljenim oziroma kriminalnim združbam. Najbolj sporno vprašanje, ki se nanaša na uporabo dronov v policiji, je povezano z zaščito zasebnosti. Droni so zelo koristni in predvsem učinkoviti pri pridobivanju podatkov, kar pa vzbuja močne pomisleke v zvezi z morebitno zlorabo ali prevelikim poseganjem v zasebnost posameznikov s strani države. V prihodnosti bopotrebno na te pomisleke odgovoriti. Prav tako si zaslužijo poglobljeno pozornost akademikov in praktikov nekatera druga vprašanja. Predvsem, kako se bodo droni uporabljali za storitev starih in novih kaznivih dejanj in kaj to pomeni za forenzične preiskav dronov in njihovih krmilnikov.

Trenutno razprave in rešitve se predlaga na ravni posameznih držav, čeprav je (vsaj na ravni EU) mogoče opaziti težnjo za urejanje teh vprašanj v okviru mednarodnih organizacij. Slovenija se sooča s tradicionalno težavo, kjerrazvoj pravne podlage zaostaja za hitrim tehnološkim razvojem. Preiskovalci se zavedajo vsestranskosti dronov, vendar pa zakonodajalec slovenski policiji še ni podelil potrebnih pooblastil za uporabo teh orodij. Članek tako opisuje nekatere trenutne in tudipotencialne možnosti uporabe dronovpoliciji in izpostavlja nekatereprobleme, s katerimibi se uporabniki dronov v policiji lahko (še) srečali.

Ključne besede: *droni, brezpilotni letalniki, ogled kraja dejanja, nadzor*