

THE USE OF TECHNOLOGIES IN ACHIEVING REAL-TIME SITUATIONAL AWARENESS DURING POLICE INTERVENTION

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Abstract: Decision-making and discretion in police interventions should be based on relevant and objective information. Complexity, level of risk, unpredictability, and uncertainty are some of the features of police interventions in which police officers need to decide how to act in a few seconds. In limited timeframe, the police officer should find and select all available information relevant to make the decision. Decision-making gets complicated and more challenging in police interventions where there is a risk of police officers getting injured and where they need to use force. The psychological pressure such situations create can negatively affect officers' situational awareness or their ability to observe and choose among pieces of information essential for decision-making. Consequently, relevant information may not reach the police managers who are expected to react to every change in the situation with an adequate decision.

The problem of loss or lack of situational awareness in complex and risky police interventions has long been noticed. In order to maintain situational awareness during interventions and timely get the necessary information, body-worn cameras, unmanned aerial vehicles (UAVs) for live coverage of events from the police intervention scene and geographic information systems (GIS) to integrate data from the field could be used. These technologies allow managers in police headquarters to follow all events during the police intervention "live", to be familiar with the deployment and status of engaged resources at all times, notice problems, and accordingly make decisions even before receiving (or in case of delay) information via the radio communication system. Having in mind the importance of situational awareness in complex and risky interventions for decision-making, the paper points to the possibilities of using body-worn cameras, UAVs, and GIS to ensure situational awareness during interventions.

Keywords: police intervention, decision-making, situational awareness, body-worn cameras, UAVs, GIS.

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INTRODUCTION

The diversity of modern police tasks and the high level of uncertainty and unpredictability of the occurrence and development of security issues and events suggest the complex conditions in which a police system operates. In most activities taken by the police (for example, arresting dangerous persons, police raids, hostage situations, police pursuits, etc.), the success of engaging police officers often depends on several factors interacting in environment which is partially or entirely out of decision maker's control. It is not uncommon to have police interventions analyzed and considered in the media, especially in cases of police use of force, when, in the public's opinion, they were not based on sound decisions. In this regard, it becomes clear that the success and development of a police organization largely depend on the quality of the decisions made in it.

Decision-making which occurs in the absence of knowledge or information about the nature of the problem and possible solutions, is the most difficult type of decision-making but also a recognizable police practice feature. As minimizing uncertainty increases the ability to make quality decisions, police action is characterized by the need to gather and analyze available information constantly. When performing complex security tasks, the available time for decision-making can be very short – from a few seconds to a few minutes. During that period, it is necessary to collect and process all available information for decision-making. In this regard, having situational awareness of events at and around the place of intervention becomes a critical decision-making factor.

Situational awareness in a complex and dynamic system such as the police organization can be crucial for its efficient functioning (Matthews, Strater & Endsley, 2004). As decisions are not made only by field police officers, the necessity of having situational awareness is even more pronounced among those far from the scene – police managers in the police headquarters². Police managers' decisions regarding the scope and manner of engaging available resources and the way police intervention should be carried out will largely depend on the information they receive from the field. As a rule, they are informed by the field police officers via radio through the chain of command. However, the nature, dynamic and complexity of police intervention can negatively affect officers' ability to observe, select and transmit relevant information. In other words, stress, psychological pressure, adrenaline, or simply the dynamics of the situation, where events alternate, will limit the flow of information from the field to police managers. Lack or delay of information from the field will negatively affect the situational awareness of police managers and thus the quality of decisions they make. In such situations, additional channels of information are needed. The use of body-worn cameras, UAVs, and a GIS makes it possible to inform police managers in real-time. By using such technologies, police managers (in the headquarters) get the opportunity to follow all events during the police intervention "live" and, based on that, to gather information about events on the scene and make appropriate decisions on time. Considering the above, the paper points out the importance of these technologies for establishing situational awareness and better decision-making in a police organization.

THE ROLE OF SITUATIONAL AWARENESS OF POLICE OFFICERS IN DECISION-MAKING

Complexity, level of risk, unpredictability, and uncertainty are the hallmarks of police interventions in which police officers are expected to react quickly and sometimes make decisions about their actions

² The police headquarters are made up of police chiefs and experts of various profiles.



in a matter of seconds. However, faced with threats, attacks, use of force, and the like, they will not always be able to get the big picture and make a rational decision about their actions. Certain police interventions, such as domestic violence, responding to active shooters, barricaded suspects, hostage rescue situations, hooligan fights, and the like, can lead to cognitive changes in police officers' perception, reasoning, and response³. This can be a significant obstacle to the efficient utilization of available information potential.

The results of a Belgian police survey on the conduct of police officers in interventions using police coercion show that due to the presence of fear and stress, police officers lost awareness of the situation or were unable to objectively assess the situation and decide on the use of firearms. It was noted that police officers shot at suspects who wanted to surrender. According to the research results, fear and stress accompany complex police interventions and cause the lack or loss of police officer situational awareness (Verhage, Noppe, Feys & Ledegen, 2018).

Situational awareness refers to the cognitive processes of perceiving and understanding the environment, essential for making timely and effective decisions. Endsley and Kiris believe that people who have lost awareness of the situation may be slower to discover problems and perceive information in their environment (Endsley & Kiris, 1995). The concept of situational awareness has its roots in late last century aviation when an increasing number of mistakes made by pilots and cabin crew were noticed, and efforts were made to develop their better awareness of the situation. A review and analysis of over 200 plane crashes found that it was the lack of situational awareness that caused the accidents (Stanton, Chamber & Piggott, 2011).

Limited awareness can be described as a situation where cognitive blindness prevents a person from seeing, seeking, using, or sharing very important, easily accessible, and observable information relevant to decision making. For example, police interventions in which there is a possibility of using force, firearms, injuries to police officers, can cause a lack or loss of situational awareness. In such situations, police officers may not utilize the information they observe as they are unaware of its significance (Epli, Ribo, & Samerfeld, 2012: 69). As a result, this information remains unused, and police action is characterized by risk and uncertainty.

In crisis decision-making process, one of the critical factors is developing and maintaining situational awareness (Klein, 2000). In this regard, it is necessary to look for alternative sources of information. One of the solutions is the use of modern technical solutions that allow gathering information in real-time.

THE ROLE OF BODY-WORN CAMERAS IN POLICE DECISION-MAKING

Police organizations have followed the intensive development and possibilities of technological innovations in this century by implementing technologies that improve processes and modes of working, efficiency, performance, speed of reaction, trust of citizens, transparency, protection of human rights,

³ In extreme situations, there may be changes in the perception, opinion, emotions and behavior of a police officer who is under stress (or extreme stress). Depending on the characteristics of the situation, some of the following symptoms may develop in such conditions: overwhelming information and lack of information; rapid heartbeat, rapid breathing, muscle cramps and dizziness; sounds are not registered or are registered very poorly; fine hand motor skills deteriorate; the emergence of "tunnel vision", reduced close and peripheral vision; reduced ability to act (Bertilsson, et al., 2020).



and the like. Thus, the last decade has been marked by the modernization of police organizations around the world using modern technologies, including body-worn cameras.

Estimates say that introducing police body-worn cameras in the daily police work will influence the behavior of police officers by improving their communication, regularity and lawfulness of actions taken, reducing the number of citizen complaints, increasing police work transparency, accepting responsibility in case of using excessive force. The use of body-worn cameras improves police officers' safety, the quality of services provided, and the measures and actions taken (Blitz, 2015).

Police body-worn cameras are introduced into police work to record police officers' actions during police interventions (Sousa, Miethé & Sakiyama 2015). However, in complex and risky police interventions often carried out by specially trained police units (e.g. SWAT), body-worn cameras can be given another purpose, i.e., they can be used for "live" coverage of events from the police intervention site. Timely information from the police intervention site is an essential factor for decision-making.

In this way, police body-worn cameras become the command staff's "eyes and ears". By transmitting the "live" image, following the events in front of and around the police officers, the command staff can observe the course of events, learn about the difficulties and obstacles in the course of the police intervention, etc. In addition, audio transmission of police officers' communication can indicate the state of situational awareness, current "psychological pressure", intentions in further actions as well as actions of suspects, especially when they use firearms and other deadly weapons.

However, when special police units are equipped with body-worn cameras some problems may arise with recording and "live" transmission of police interventions. Recording of events during police intervention depends on the camera position on the police officer's body. For example, police units in Serbia have different purposes and use different uniforms, equipment, and weapons to perform their tasks, which affects the choice of the place on the police officer's body to put the camera. This is especially pronounced among special unit members due to the specific protective equipment and weapons they use. The camera on the police officer's body should be put in a place from which the police officer can record the entire space in front of him in an unhindered and unobstructed manner. In police practice, different solutions have been noted when it comes to the camera's position on the police officer's body. Cameras are positioned on the police officer's chest, shoulder, and protective helmet. All modes of wearing a camera can affect the smooth recording of police intervention to a greater or lesser extent. For example, capturing the space in front of a special unit police officer with a camera on his chest is not possible in cases when he keeps the rifle in a ready state. Then, for the most part, the camera would record the police officer's hands and rifle. However, mounting the camera on the weapon barrel eliminates this shortcoming, but the question arises as to what the camera will record when the weapon is not in the ready position or when the weapon is replaced (for example, taking a short instead of a long weapon).

While police worldwide are looking for the best solution, one of the ways to overcome this problem may be to prescribe or standardize a certain place on the police officer body, depending on the type of police intervention. The other way may refer to a combination of different solutions. For example, with some police officers, the camera should be placed on the helmet, with other team members on the shoulder, with others on the chest, with others camera can be mounted on the weapon etc.

Another problem related to using body-worn cameras during special security tasks is to preserve the image resolution in bandwidth to the headquarters. Modern body-worn cameras have a high recording resolution, with a higher quality image ensuring noticing important facts. However, in interventions with a large number of police officers, the high resolution of recording is automatically reduced



in the transmission channel. This comes to the fore in a situation where, for example, the intervention takes place in rural conditions, without the possibility of access to commercial communication channels or in basements and similar premises where there is a problem of signal coverage. Therefore, when planning interventions involving a large number of police officers, one should be aware of the technical possibilities of the bandwidth and accordingly equip the optimal number of police officers with body-worn cameras (e.g., only those whose position in the tactical deployment allows a quality view of the situation) to avoid significant image quality degradation.

THE ROLE OF UNMANNED AERIAL VEHICLES IN DECISION-MAKING DURING POLICE INTERVENTION

During the last decade the use of UAV attracted huge popularity worldwide. With constantly decreasing cost of UAV, they are becoming more common in police practice. Before the introduction of UAVs in the police, police officers could receive air support only from helicopters. Today, there is opportunity for every police officer to have their own air support in the trunk of their police car (Shinnamon & Cowell, 2019: 5). Ready for immediate take-off at any time, the police drone can be quickly on site without involving any greater resources. Compared to helicopters, UAVs are more affordable in terms of purchase and use, offer a broader range of uses (greater operational flexibility), are easily portable and can be ready in just a few minutes, can be used in risky situations (risky for the pilot and/or aircraft) or beyond the technical capabilities of a helicopter⁴ and can help perform police affairs that traditionally do not involve the engagement of helicopters such as crime scene recording (Milić, Milidragović, 2019). Most often law enforcement agencies are using them in hostage negotiation, crime scene investigation, search and rescue missions, active shooting scenarios, apprehension of dangerous criminals, border protection with drones searching for illegal crossings and traffic monitoring.

Planning complex and risky police tasks requires a high level of information. However, due to new or unforeseen circumstances, interventions may take place contrary to the plan. This leads to the information deficit that should be overcome as soon as possible to make quality decisions in response to new circumstances. Enabling real-time video surveillance, recording certain persons, buildings, phenomena, and processes in space, and transmission of live video signals have made UAV an essential tool in planning and executing complex and risky police interventions (Milojković, 2015: 7). The use of UAVs in complex security tasks comes to the fore both before and during the intervention. Using UAVs after the intervention usually comes down to recording a crime scene in order to record all traces and evidence.

COLLECTING INFORMATION BEFORE POLICE INTERVENTION (RECONNAISSANCE)

Gathering information about the task is the first action taken after receiving the order for the task. Police officers strive to gather the necessary information about the space, the layout of the facilities in it, access roads, the specifics of each facility, and other characteristics, thus avoiding the occurrence of unforeseen circumstances. The complexity and riskiness of events such as hostage situations, anti-terrorist actions, or deprivation of liberty of persons in urban areas require a covert way of collecting

4 For example, the use of firearms at the drone, surveillance of the area endangered by atomic, biological and/or chemical substances and the like.



data. Small and silent UAVs, equipped with high-resolution cameras or thermal cameras, are sometimes the only option for safe and covert data collection in these and similar situations.

COLLECTING INFORMATION DURING INTRVENTION

Speed and mobility in the airspace, silent approach and recording of the space and objects in it, as well as the possibility of real-time transmission of the recording become significant features of UAVs supporting the police during the intervention. By observing from above, UAVs can limit the risk of exposure of police officers and thus prevent injuries or loss of officers' lives. By collecting and transmitting video recordings of events in real time, through a safe communication channel, the police leadership obtains the necessary information for the timely response of police officers in accordance with the new (emerging) circumstances.

Aside from their abilities to capture and transmit video, UAVs can be equipped with onboard microphone and integrated speaker that allow for officers to have two-way communication with a suspect or hostage. The microphone allows officers to hear footsteps or a suspect's communication while remaining undetected helping them to locate, isolate and communicate with suspects. In case suspects try to flee the scene, UAV can inform police pursuit about suspect's movement. Having this in mind, deployment of more than one UAV during police intervention is recommended. While one continues scene surveillance, other(s) could be diverted to police pursuit or could provide scene coverage from different side, angle and/or altitude.

Recently UAVs started to be equipped with an armature, capable of breaking tempered, automotive, and most residential glass. This feature could be used to enter a building during active shooter situations without ever physically sending people inside or to make the way for injection of stun grenades, tear gas containers etc.

When utilized for special police intervention UAVs must remain idle with full video and audio transmission for up to 10 hours. Many UAVs commonly used today in police practice only have flight duration of about 30 minutes. While more powerful batteries are still rare in police practice, good alternative could be tethered UAVs. Tethered UAVs receive power over a thin, long-range cord, which provides unlimited flight time.

THE ROLE OF GEOGRAPHIC INFORMATION SYSTEM IN DECISION-MAKING

Spatial data are vital for decision-making in all spheres of life, including the police. With the greater availability of spatial data, tools for their collection, processing, analysis, and presentation are also being developed. These are geographic information systems – GIS. By allowing the decision-maker to assimilate a large amount of data from different sources, GIS technology becomes a critical decision-making factor in the police. Virtually everything police do happens at some location in space. Therefore, GIS can provide valuable assistance to police officers in assessing the situation, preparing and making a decision and monitoring its enforcement, reporting and analyzing the execution of the task, or measures and actions taken. In this way, GIS becomes a vital decision-making factor at all police organization levels.



In a broader sense, GIS is a “smart map” tool that allows users to organize data, make interactive queries, and get answers about what is going on in the field. In this regard, GIS can play a significant role in achieving and maintaining situational awareness while performing high-risk tasks.

When intervention starts, command staff need accurate and comprehensive information about what is happening and where it is happening and how different stages of operational plan are moving forward. Police intervention is dynamic set of activities, where different things may happen simultaneously on different locations, but may impact each other (e.g. if police officer face obstacle on one location, he/she may require additional resources – backup from another location). As an intervention unfolds, command staff need immediately accessible and actionable information to make the best decisions at the right time. Interactive map can show area of interest, its geography, road infrastructure, tactical resource assignments and many other spatial data relevant to particular police intervention. As the situation evolves, map can be easily updated and these updates can be seen by all officers involved in police intervention. Showing where officers are, what situation they are facing and anticipating possible problems before they can occur are indicators of situational awareness existence. Maintaining situational awareness requires collaboration, information sharing, and a unified view of incident information. Web GIS makes this possible.

Seeing what is happening in real time is a critical advantage during police intervention. GIS allows integration with live information or video feeds (e.g. body-worn cameras, public cameras, cameras mounted on UAV, GPS pings, social media feeds etc.) to effectively monitor changing conditions.

In order to ensure quality intervention monitoring and effective deployment of resources, particularly useful are *operations dashboards*. By displaying intuitive and interactive data visualizations on a single or multiple screens, they facilitate achieving situational awareness. By using different data filters, they can be easily tailored to each phase of the particular intervention.

CONCLUSION

Decision-making in police organizations should be based on timely and accurate information. Unfortunately, dynamic, complex, risky, and uncertain police interventions often entail the inability of police officers, both those on the front line and those in the headquarters, to spot and select important information for decision-making. The absence of such information carries the risk of making mistakes, and mistakes in the police sphere can result in the loss of human life.

Lack or loss of situational awareness is one of the police intervention problems. Aware of this problem, police worldwide are taking various activities to overcome it – from organizing various mental and tactical training in simulated conditions to implementing modern technical means. Body-worn cameras, UAVs, and geographic information systems are becoming important tools in crisis events that should ensure decisions are made based on current and accurate information from the scene of police intervention. Body-worn cameras should provide a frontline officer perspective, UAVs should give situation overview from an aerial perspective, while real-time GIS and operations dashboard provide the ability to simultaneously integrate, analyze, and display these and many other data in order to achieve situational awareness. Equipping the Serbian police with these technologies should contribute to its efficiency. For it to happen, it is necessary to consider the possibilities of these technologies and anticipate possible problems of their implementation. This paper makes a modest contribution to the achievement of this goal.



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