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Criminal use of drones and possible lines of defence

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Abstract

The use of an Unmanned Aerial Vehicle (UAV) with criminal intent falls within the scope of activities that are intended to achieve illegal or objectionable ends and may endanger human life, public order, or national security. The criminal use of drones, as unmanned aerial vehicles are commonly known, raises a number of dangers and ethical issues that have become increasingly pressing with the development of modern technology. Although drones were originally designed for military and industrial purposes, the proliferation of easily accessible and cheap models has opened up new opportunities for criminals. The experience of innovation in recent years – in the battlefield – also shows that the development of capabilities such as advanced weapon systems, drones, and other strike-measuring devices has accelerated significantly. Today, unmanned systems are used across the full spectrum of communications, reconnaissance, strike measurement, and support. Our aim is to raise awareness of the problem posed by these devices and to highlight possible ways and means of defence.

Keywords: unmanned systems, drones, drone protection, malicious use.

1. Unmanned systems

Unmanned systems, also known as drones, have developed significantly in recent decades and have a wide range of applications in modern society. Systems with unmanned mobile platforms are commonly referred to as UxS.

Depending on the type of deployment, they can be categorised as land-based (UGS – Unmanned Ground System), airborne (UAS – Unmanned Aircraft System), or maritime (UMS – Unmanned Maritime System). UxS use sensors to detect the environment and its changes and are able to process the information received semi-automatically and autonomously. These devices, known as “drones”, have undergone enormous change over the last decade. These changes are mainly due to technological developments and conflicts in the world.

Confusingly, the term “drone” is clearly associated in the vernacular with unmanned aerial vehicles, and this will be very difficult to change, if it is to be changed at all.

Today, unmanned systems are playing an important role in many areas, and their technological development is affecting many sectors.

1.1 Military applications

Unmanned systems were originally related to military applications and have become an important part of modern warfare. As a result of the experience of armed conflicts of today, it is now clear that the emergence and mass deployment of UAVs is changing the nature of warfare. They have become ubiquitous, from the combat to the strategic level. Opinions differ, however, as to whether this is a revolutionary change or 'merely' an evolution of warfare. Drones are essentially used for tasks that would otherwise be carried out by human power or would require the direct or indirect presence of a human being, but their loss or injury does not put personnel at risk, which in turn allows commanders to accept a significantly greater risk. Nowadays, drones and drone systems of various sophistication are available to all actors in the security environment. Regular armies and non-state actors are developing their reconnaissance, strike, and other drone capabilities. Its main applications are in reconnaissance, data and information transfer, EW missions, deception, logistics, medical transport, and various strike applications such as explosive ordnance disposal, chemical delivery. Defending against them in both battlefield and urban environments is an extremely difficult task, which is a significant factor in today's environment [1].

1.2 Agricultural application

Drone applications in agricultural fields have also developed significantly in recent years. The most typical applications include various types of parcelling, survey areas, spraying, and harvest forecasting. One may ask why this area is vital in view of the objectives of this publication. Well, it is simple: in the context of conflicts, it must also be recognised that the main objective of two or more opposing forces is to put the enemy in a position where he is forced to give up his territorial, power, or economic ambitions or position. Just think of the longer-term impact on the economy of using drones to destroy crops in agricultural areas. And in the short term, it could be used to disrupt troop movements, as a pass over an area planted with crops could result in huge losses if the area is set on fire. Although this is a rough idea, it cannot be ignored.

1.3 Logistics and transport

The use of drones in freight forwarding is gaining increasing attention as it offers significant advantages in the fast, cost-effective, and safe transport of goods. Many companies are focusing on their environmentally friendly features and extreme speed. Unfortunately, malicious use is also possible in this area, as it is not possible to know exactly what the package arriving at the exact address by drone contains. “However, the real threat is when explosive devices are targeted using this method. In this case, the unsuspecting victim has no idea that an explosive device, for example, may be in the immediate vicinity instead of the plug, book, or food they ordered. Sceptics might argue that, even from a distance of 16 kilometres, the bomber would not know when to detonate the device. To those who think this way, I recommend studying explosive devices with different sensors. Since the explosive devices can be delivered in a sealed package, only a light or a photocell is needed for the system to work. The victim in this case has no idea that he is playing with his life the moment he opens the package” [2]. It has been more than a decade since the risks of logistics deliveries by drones were highlighted, but no countermeasures have been taken. It is also certain that if a successful attack is carried out, it will not be publicised, as drone transport or drone logistics itself is a huge field that can suffer huge losses from bad publicity.

1.4 Infrastructure inspection and maintenance

Unmanned systems are a great help in areas where human access to infrastructure is difficult or risky. In this respect, access, repair, and maintenance of high buildings and bridges are made

possible. For critical infrastructures, the monitoring, repair, and maintenance of energy supply systems is perhaps the most challenging. It is no coincidence that this is perhaps the sector most at risk from deliberate attacks, sabotage, and military targets. In the case of critical infrastructures, it is impossible to list all the sectors that would not pose a problem to those living, working, or policing in the area in the event of an external attack. In this respect, oil installations, communication stations, and energy sector installations are also critical. Looking at conflict zones around the world, on the other hand, there is an increase in the vulnerability of health facilities and military installations. Drones and, in this respect, cruise munitions can cause enormous damage at the local, regional, and even national level.

Loitering Munition is ammunition whose trajectory or flight path is controlled. Depending on the mission profile, it searches for predetermined targets on the ground in the area of operations and, once enabled by the operator, engages moving targets with high accuracy. The LM is intended for single use against enemy targets. Once launched, it does not return and cannot be returned to a ready-to-use state. The increased threat posed by unmanned air systems applies to both UAS and LM. Both are often referred to indiscriminately as “kamikaze drones” when used as active assets.

1.5 Environmental monitoring and research

Mention should also be made of the use of unmanned systems to protect the environment. The monitoring of nature reserves, disaster monitoring and detection, and monitoring of climatic changes also fall into this category. This is perhaps the only area where there is currently no risk of criminal use.

1.6 Entertainment and media

The use of unmanned systems for entertainment purposes is also widespread. Drones have become an essential part of sports coverage. Aerial coverage offers a whole new perspective on events and, unfortunately, the dangers are inherent. It may not be common, but these systems can also malfunction, lose control, or fall due to physical contact, posing a danger to those in the area. This does not mean that the systems are being maliciously damaged; the indirect risk is still there.

If we look at future trends, it can be seen and realised that unmanned systems will continue to evolve in the future. In our opinion, the main trends in the development of drones will be determined by the emergence of autonomous systems, 5G, and its additional components, and "Swarm" technology. We are confident that these are the areas where protection needs to be created now, regardless of the fact that the final trends are not yet known.

2. The use of drones in terrorist activities

The intertwining of terrorist activities and drones is a growing concern in many countries around the world, as drones have become a highly effective tool for terrorist groups, particularly in carrying out terrorist attacks. Drones offer terrorists a new and highly effective way to carry out conventional attacks without the need to be directly present on the ground. The wide availability, low cost, and ease of use of drones have led to their rapid adoption by these types of groups [3]. The main areas of application are:

2.1 Bombing

Guided Explosive Devices: One of the most dangerous applications of drones is the delivery of explosive devices and the attack on targeted objects. Drones are capable of delivering small but effective explosives and explosive devices, and dropping them directly on targets. Terrorists can use

these attacks to target selected targets, such as government buildings, military bases, or even mass gatherings.

Drones as "mobile bombs": Drones can reach places where other conventional explosive devices are more difficult to reach. Drones flying at low altitudes can reach the target area with pinpoint accuracy, making them difficult to detect and allowing them to attack quickly and by surprise.

2.2 Surveillance and spying

Covert surveillance: Drones offer terrorists an ideal tool for monitoring targets, government buildings, military bases, or strategic infrastructure. Drones can hover over desired locations for hours, recording movements and events without posing a direct threat to observers.

Covert surveillance: smaller drones, which can be easily hidden, can observe people and the environment undetected [4]. Drones can use light and infrared detection, so they can operate effectively even at night.

2.3 Communication disruption

Jamming attacks: Some terrorists may also use drones to jam communication and navigation systems. Disruption of sensitive equipment such as mobile phones and radio communication systems can contribute to reducing the effectiveness of security measures.

2.4 As a means of transport

Smuggling of weapons and drugs: Drones are increasingly being used for illegal transport, including drugs, weapons, and other illicit substances. Drones are able to bypass traditional border security systems as they do not require any formal entry or customs clearance.

2.5 Creating a mass disaster

Biological or chemical attacks: although drones do not yet have biological or chemical weapons for widespread use, they could theoretically be able to deliver small quantities of toxic substances or infectious micro-organisms to the intended target. Such an attack, although small in range, could create enormous fear and panic.

3. The dangers of drones

Drones are an increasing challenge for security authorities. The following threats are of particular concern in relation to the use of drones by terrorist groups:

3.1 Vulnerable targets

Drones allow terrorists to precisely target public services, critical infrastructure such as power grids, water supply systems, hospitals, and other critical public or private facilities. Such attacks can cause significant economic and social damage [5].

3.2 Difficult to detect

A major advantage of drone attacks is that they are extremely difficult to detect. Because drones are small and relatively slow, they can easily evade conventional defence systems such as radars and missile defence systems.

3.3 Mass panic and psychological impact

Drone attacks can have a particularly psychological impact on society, as civilians who are unable to predict when and where they may be attacked may experience increased stress. A small explosion can be enough to cause panic in the population.

3.4 Strategic threat

Drones are capable of carrying out highly precise attacks, giving terrorist groups the opportunity to target high-profile individuals (e.g., political leaders, military commanders). This type of targeted attack can have an extreme impact on political stability.

4. Defending against drones

A number of security measures are in place to counter terrorist use of drones, but defending against them is complex and costly. In terms of the amount of literature available and processed, and the number of codes and regulations adopted and implemented, on drone protection (both active/drone countermeasures and passive protection), it can be said that there is still room for improvement. We believe that this is simply because it is a relatively new threat, and the time between its recognition and the development of the right responses to it has been extremely short. [6]

In a nutshell, drone protection is the sum of activities to protect forces, assets, and critical infrastructure from the harmful effects of drones, whereby the coordinated efforts of the relevant disciplines can avoid or minimize the damage caused by drones.

With regard to the active technical conditions for drone protection, only “systems of systems” employing multiple sensors and “effectors” simultaneously and in a system can provide effective protection. It is therefore a complex task for the various platforms of air defence, coordinated in time, height, and distance [7]. Some defence options are described below:

4.1 Sensor systems

Radar systems: Radars for detecting drones are capable of monitoring low-altitude moving objects. These systems can monitor flight zones and provide timely alerts if a drone is in an undesired area.

Optical and infrared sensors. Infrared systems are also capable of night detection.

4.2 Signal jamming

Jamming is a technique that jams the communication between a drone and the control station by emitting electromagnetic signals. If the drone is unable to communicate with its pilot, it may return to its point of origin or crash. The effectiveness of jamming depends largely on the strength of the jamming, the type of drone, and the communication frequency.

Radio Frequency (RF) jamming: RF jamming can disrupt the communication and navigation systems of drones, causing them to become uncontrollable or shut down.

GPS jamming: Interference with the GPS-based navigation systems of drones can force them to return to a safe location or make an emergency landing.

Network jamming: recent developments could include interference with 5G, Wi-Fi, and other wireless communication systems that could profoundly affect the operation of some drones.

4.3 Defence systems

While jamming and detection are important, integrated systems often also include physical defenses that can stop, intercept, or destroy a threatening drone. The most common such devices are:

Drone netting systems: The purpose of such systems is to intercept the drone without completely destroying it. The net is used to drop the drone in a safe place after it has been intercepted. Captured drones are usually stopped on the spot, thus minimizing the risks.

Firing (non-lethal weapons): Some systems use special firearms that target the drone. Such weapons usually do not kill, but simply destroy the drone's electronics or propellers, causing it to stop.

Energy-based systems (lasers, microwave weapons): Energy-based weapons incorporated into integrated systems are capable of destroying the drone's electronic systems in a targeted manner. Lasers and microwave weapons can attack the drone's sensors, communication systems, or engines, disabling or destroying them.

Anti-drone systems: In some countries and organizations, systems are in place to physically neutralize drones. Such systems may include net interception, electronic jamming, or even drone attacks.

4.4 Automated management systems

Modern integrated systems often include autonomous systems that can automatically react to drone threats. These systems automatically detect drones, classify threats, and immediately initiate the appropriate response, whether it be jamming, interception, or destruction.

Automatic target identification and tracking: Sensors and AI-based systems enable fast and accurate drone identification and tracking. AI enables the system to automatically select the most appropriate defensive response.

Integrated responses. For example, the system can first warn, then trigger a jamming attack, and finally, if necessary, physically destroy the drone.

4.5 Legal and regulatory measures

Regulation and licensing: Stricter regulations and registrations on drones could facilitate the identification and tracking of potentially dangerous individuals and groups.

Defence authorities: State and international cooperation is key to countering terrorist drone threats, as some attacks may cross international borders.

The convergence of terrorist activities and drones poses serious challenges to global security. The easy availability, low cost, and versatility of drones provide terrorists with the opportunity to carry out attacks, observe targets, and disrupt security systems effectively. In addition to adequate defence mechanisms and legislation, international cooperation is important to minimize terrorist activities in the future.

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