



Research Paper

# Technology-Enabled Crime Prevention: Mapping The Crimepreventiveutility Of Droneas Crimebarrier In India.

Dr. Devakumar Jacob  
Faculty, SLRCG-TISS-Mumbai.

*“Westronglysupportthelimitedandeffectiveuseofdronestoimprovevisibility,situationalawareness,anddeputy safety forpriorityonecalls.Duringour first year and a half of operating, we’ve flown more than 750 missions,resulting in 31 suspects being arrested and five missing or endangered peoplebeing found. We are saving tens of thousands of dollars deploying drones asopposed to our piloted agency helicopters.In many situations, our drones aremore versatile and effective than a helicopter.”Sheriff Grady Judd, PolkCounty(Florida) Sheriff’sOffice*

*Received 18 Feb., 2023; Revised 28 Feb., 2023; Accepted 02 Mar., 2023 © The author(s) 2023.  
Published with open access at [www.questjournals.org](http://www.questjournals.org)*

## I. Introduction.

Everyone is instantly transformed and connected in this new era made possible by technology. The criminal justice system places a large emphasis on the use of technology to aid in crime prevention. Yet, technological innovation is in many roles of Technology in Crime Prevention & Policing. Technology-assisted legal crime control, crime detection, and criminal investigation are not new to law enforcement organisations. An attempt was made to provide an evaluation of the many different technology-driven solutions that have been used for the prevention of crime over the course of the past few decades. In addition, a critical analysis of how contemporary hardware and software-based technologies, such as pervasive sensors and machine learning, could be used in the (not too distant) future to improve the reporting and prevention of criminal activities was also performed.

### 1. What exactly is meant by the term "drone"?

Unmanned aerial vehicles, sometimes known as drones, are aircraft that are able to fly autonomously without the assistance of a pilot. In addition, drones are aircraft that do not have pilots on board and whose flight (speed, navigation, aerobatics, etc.) is controlled by onboard computers. Drones are also known as unmanned aerial vehicles (UAVs).The use of drones in the investigation and prevention of crime has been shown to be highly effective. The collection of a wide variety of information and data that can be utilised in the course of legal proceedings is facilitated, in point of fact, by the employment of drones. Yet, because these tools have the capacity to invade the privacy of their users in a very invasive manner, there are now significant concerns over fundamental rights. The purpose of this study is to investigate the potential applications of drones in today's criminal justice system, as well as to determine whether and how their utilisation is compatible with constitutionally protected rights to privacy and data protection.One of the most difficult topics facing law enforcement today is the utilisation of drones for the purpose of monitoring criminal behaviour and providing a response to it. There is no denying that drones have several applications, but critics tend to exaggerate the risks associated with their misuse. The technology behind drones is quickly gaining popularity as a result of their qualities and capabilities, which make them more effective than human sight. People's perceptions are limited, but the technology that is standard on many drones enables them to effectively deal with infractions of this nature.It's a great beginning step towards assisting law enforcement in figuring out the appropriate response to the situation as a whole. Drones of today are outfitted with a multitude of propellers, which grants them the ability to move more quickly and to manoeuvre more easily.

When interacting with human teams, there are limits placed on the amount of territory that may be traversed in a certain amount of time. The speed at which these drones can operate increases the amount of ground they can cover in the same amount of time. This enables law enforcement to respond to a situation in a significantly timelier manner.Law enforcement agencies can also benefit from the use of drone cameras and

sensors. These days, drones are equipped with cameras that take pictures of such high quality and reliability that they can be employed by law enforcement agencies. The images taken by a drone that captures a criminal in the act can be used as evidence under the appropriate circumstances, or they can help identify the perpetrator in situations when the criminal gets away.

The use of thermal imaging equipment is another technology that can be of significant use to law enforcement. By using standard search tactics, it may be difficult to locate a person who is attempting to conceal themselves. The use of a drone that is equipped with thermal imaging enables the body heat of potential suspects to be identified. Because of this, law enforcement is effectively given the ability to see through any impediments utilised by a suspect to escape arrest, which ultimately results in a more efficient capture. Obviously, each one of the images that were taken by the drones can be transmitted in real-time. Live picture tracking is an essential tool for law enforcement agencies to use in order to respond to incidents as soon as they arise. This live broadcast can assist in the tracking down of a suspect and the dispatching of teams to the appropriate location in order to apprehend the criminal. When it comes to tracking a suspect, drones are superior to older technologies such as helicopters in terms of performance. Also, during the past few years, there has been a dramatic improvement in the battery life of drone technology. Due to limitations imposed by the hardware at the time of their introduction, early drones were not able to fly for very long. Drones do not need to be recharged nearly as frequently as they once did, which enables them to be used for operations that are significantly longer. It is possible that this is the single most important innovation that has made it possible for drones to become an essential mode of response rather than merely another instrument at their disposal.

The fact that drones make the jobs of law enforcement officers substantially safer is an undeniable benefit of using them. Operators of drones can be stationed at a secure distance from the action as long as the device is operating within the acceptable parameters of its operating range. This results in a major improvement for human responders who are required to be present at the scene despite the hazard. Because of this, drones are an excellent substitute for active situations that involve high danger.

## **2. The scope of crime prevention**

A recent innovation in drone technology is the ability to replicate crimes. Drones can map and recreate crime scenes, allowing investigators to analyse them from previously inaccessible perspectives. As a result, there is a broader understanding of the aftermath of a crime, which should contribute to faster case resolution. And, as drone technology evolves, law enforcement should anticipate these possibilities. The potential role of drones in crime prevention should not be disregarded. Drone surveillance is a deterrent to criminals in and of itself. In terms of crime, the adage "a watched pot never boils" implies that less crime is done. Criminals may stop committing a crime if they fear they will be caught by drones, which is likely given the field's developments.

Several people, however, are opposed to the use of drone technology. Some fear that a system of continuous surveillance via drones may result in a police state comparable to Big Brother. Yet, in the end, any technology can be used. It is vital to hold law enforcement accountable when using these technologies in order for them to be used to keep the community secure in the future. Obtaining a warrant before using drones for searches is one precaution to guarantee that law enforcement does not abuse them. This alleviates some of the worries of those who argue that unmanned aerial surveillance would lead to hazardous policing by prohibiting law enforcement from employing drones in situations when there is no reasonable justification to do so. The issue with this type of law enforcement drone legislation is that it inhibits drones from being used in more pleasant public safety situations. Drone technology can be utilised to monitor the crowd and ensure that no misbehaviour occurs at large-audience events.

Another solution that may and should be implemented to hold law enforcement accountable is to require them to share data on their drone use. Law enforcement organisations should be willing to publish information about how they use drone technology in their operations since transparency is vital in the adoption of new technologies. This will allow them to show the public the numbers underlying the benefits of drones and ease of use. No one can deny that some restrictions are necessary to prevent law enforcement from exploiting drone technology, but the advantages clearly exceed the drawbacks.

## **3. Recognition of faces**

As a weapon for law enforcement in combating crime, facial recognition technology has immense promise. The technology has been around for a while, but real-time analytics algorithms make it significantly more effective. Seven individuals were detained at a Six Nations rugby match using Automatic Facial Recognition (AFR) software, which allows police to compare a suspect's image against 500,000 jail photographs to find a match. To evaluate whether someone is telling the truth, eye detection software and motion and sensor technology are being used to track psychological and physical activity. Numerous state investigative agencies are already piloting an Automated Virtual Agent for Truth Assessments in Real Time

(AVATAR) to help border security officials determine if people are entering the country legally or for the correct reasons.

This part analyses the technological advantages and disadvantages of a wide range of sensing devices in the context of crime prevention, in order to identify new research opportunities and encourage research activities in the sector. Drones can be dangerous in the wrong hands, but they can also be useful law enforcement tools. Attendees learned how law enforcement can use drones to reconstruct a crime scene by shooting it from all angles and then transmitting the data to a 3D printer. Drones can also be used by law enforcement to do surveillance, assist with traffic accident investigations, check natural disaster sites, and more. The conversion of drones and artificial intelligence (AI) technology offers further benefits to enhance current police capabilities, ranging from increased officer safety and efficiency to live-streaming of crises.

Drones can also provide crucial evidence in investigations and prosecutions: digital data such as speed, height, GPS locations, and flight records can reveal information about the offenders involved, and physical data such as fingerprints and DNA can also be present. Through the continuous development of these capabilities, INTERPOL seeks to assist member nations in increasing information exchange on drone occurrences and strengthening their capacity to conduct successful forensic tests on confiscated drones.

#### 4. Mapping of Cities

Indian cities have been the subject of numerous terror attacks, and the use of drone monitoring to map out the entire city for any unexpected crime attacks or re-storm evaluation allows the police to prepare and avoid crimes and negative effects. mapping extensively. Police drones in high-traffic areas are common around the country. Instead of paying a high hourly rate for a helicopter to cover the entire city, a police department might purchase a few drones and accomplish the same job for the cost of the electricity in the batteries. These maps can then be used for future events or crime scenes. They can also be used to demonstrate the effects of natural disasters before and after they occur.

Every year, hundreds of police departments buy drones to help them catch criminals. Ground units may have trouble detecting a suspect who takes to the roof. The ability to keep an eye on the sky provides valuable information and directs ground forces to appropriate locations. Eliminating uncertainty also aids police officers in dealing with stress. Suspects typically report not being aware of drones since they are so small and quieter than helicopters. Drones can also aid in the identification of suspects and any weapons they may be carrying. Drones can also aid in the identification of suspects and any weapons they may be carrying. When a man holed up in a hotel threatened to detonate a grenade, authorities were able to identify the explosive as inert, saving lives when the man arrived.

Drones can help with crime scene investigation in several ways. They can be used to obtain evidence that would be difficult to obtain on the ground otherwise. Two drones can survey a crime scene and deliver maps and 3D photographs in minutes. They can be used for lighting at night or in low-light conditions. They can manually capture 60+ frames per second from a still camera and record 4k video as needed. All of this could be done in a fraction of the time it would take a ground team to do the same investigation. Drones are increasingly being utilised to reconstruct situations in 3D. This is beneficial for several reasons. First, police can use a drone to collect evidence from previously inaccessible perspectives without using a pricey plane. This was seen in a plane disaster at Daytona Beach, when officers determined that the plane had also hit another house before crashing into the roof of the original crash site. Second, they can measure everything on the ground at several times the speed. Finally, they can collect evidence without interfering with traffic.

Drones can help with traffic management during peak hours or at packed events. Ground units may have trouble determining the sources of traffic congestion. They may quickly assess the situation, devise a solution, and radio to traffic light authorities to change the rate of red-green lights to better control the flow with a drone overhead. The same drones may be deployed to monitor vehicle speeds and notify ground workers of infractions.

**Table-1 Effective crime prevention by drone application**

Rescue Operatio n.	disastermanagement	SWAT operations.	monitoringcrime andtraffic.	Night Visio n	Collection evidence	IdentifyingCrimi nals	Image/facealrecog nitionn
83%	79%	76%	72%	80%	%	80%	97%

Sample research done in the USA reveals that drones assist in proving an effective crime-preventivesystem. Search and rescue operations, as well as the tracking down of lost persons and animals, are all possible applications of drone technology. They are widely utilised in searches for missing hikers as well as for elderly people who have become disoriented and wandered away from their homes. In the event of an accident, they can even be utilised to locate victims who have been ejected from their automobiles.

**Table-2. DroneUtilityandCrimepreventionattheCity ofVirginia.**

PoliceDept.	FireDept.	OfficeEmergencyManagement	Conventionofficer /officer/anotherBureau
AccidentReconstruction	Emergenciesscenes	Operationscentersandimmediate situationalawareness	PromotionalVideos
TacticalSWATOperations	StructuresFires	Identifyingthetornadopath	Specialevents
Intelligence andpiecesofevidence gathering	Hazardousmaterial Incidences	Specialeventsmanagement	VirtualTours
TrafficandaCrowdManagement	Damageassessment	RescueandSearchinbothwaterandLand	Projectdocumentationandre construction

Drone rescues are becoming more regular by the year. When equipped with thermal cameras that detect heat signatures, they are especially useful at night. Major fire departments usually purchase their own drones; however, the cost for smaller towns or cities may be too high. Police departments that use drones have discovered that they may help the local fire department by collaborating to spot the fire, identify potential victims, and divert firefighters' resources accordingly. In one example, Daytona Beach police used thermal imaging to pinpoint a hot spot in a hotel fire. The fire department was able to quickly direct their hoses to the scene. It may be difficult to get ground units to affected areas following hurricanes, tornadoes, and other natural disasters. It can also be difficult to fly manned aircraft into hazardous areas without harming the pilots. Law enforcement organisations routinely employ drones to survey catastrophe sites and identify regions and individuals in need of assistance. Drones were used in Houston in response to Hurricane Harvey, as well as in Florida following Hurricane Irma. Drones can find stranded individuals faster than ground units. They may carry medical supplies as well as other necessities like as rescue ropes and life jackets. Police drones can help locate illegal and unregistered drones that may endanger the environment. Many private drone operators do not have the necessary training or licencing to fly their drones on public property. Yes, if you don't understand the images below, you shouldn't be flying a drone. When an illegal behaviour is discovered, a ground unit can be dispatched to find the perpetrator and offer them the choice of law instruction or arrest and fines if they refuse to comply.

**5. Land mining crime reduction.**

An entrepreneur and designer by the name of Massoud Hassani is hard at work developing the Mine Kafon Drone. The operational prototype is a multicopter that can be attached to a variety of different pieces of equipment to carry out the search for landmines and remove them in three stages. Using a camera, it navigates in a grid pattern across the minefields while building a three-dimensional map of the area. It comes back to the region at a low level and has a metal detector dangling beneath it as it does so. This locates mines and plots their coordinates on a map using GPS waypoints. Mines may also be detected with this. At last, the unmanned aerial vehicle flies back to the mines and attaches explosives to them, which are then detonated remotely. Should they persist in their refusal to cooperate, they will be subject to incarceration as well as fines. Hassani claims that the new method will be substantially less expensive, significantly faster (20 times faster), and significantly safer than the older methods, which used either humans or dogs.

**6. Workplace crime monitoring**

Another area where drones can help is worker safety. In 2014, 4,386 people were killed on the job, according to the Occupational Safety and Health Administration (OSHA). Construction is the most dangerous industry. A construction site accounts for one out of every five occupational fatalities, with falls being the leading cause of death. About half of all construction fatalities were caused by a worker falling from a high place. The simplest way to avoid falls is to keep people on the ground and employ drones for heavy lifting. Drones are already being used to photograph construction sites and gain access to locations harbouring hazardous materials. Additionally, construction teams all around the world are using unmanned aerial vehicles (UAVs) to inspect dangerous structures, keep better safety records, develop models for improved planning and communication, and ensure projects stay on track and within budget. Drones are also being used in agriculture and forestry for similar goals. Unmanned aerial vehicles (UAVs) definitely make the world a safer place. And we should be grateful for the fact that drones are reinventing safety (rather than being angry about it).

**7. Drones as a threat: how to avoid a terrorist assault.**

As drone technology becomes more readily available around the world, law enforcement is becoming increasingly concerned about the possible use of drones in a terrorist event or assault against critical infrastructure and soft targets. Countries should expect to witness an increase and evolution of this threat as drones become less expensive and their potential applications expand. Terrorist groups using drones for surveillance and delivery of chemical, biological, radiological, nuclear, and explosive materials in conflict

zones, as well as an environmental group repurposing a hobby drone to enter a nuclear site's secure airspace and crash into a building, highlight the current reality of the threat posed by the illicit use of drones. Experts from the FBI, NATO, the United Nations Security Council Counter-Terrorism Executive Directorate, national police agencies, and the private sector have emphasised the importance of a coordinated global law enforcement response that combines the expertise and developments made by various countries, military agencies, and the private sector to counter the threats posed by the illicit use of drones. "With terrorist groups increasingly using drones to attack critical infrastructure and soft targets, there is an urgent need for the international law enforcement community to exchange information and share best practices." "INTERPOL is committed to assisting its member countries in securing critical infrastructure by raising awareness, sharing best practices, and facilitating information exchange on terrorist incidents involving drones," said Patrick Stevens, Director of Counterterrorism at INTERPOL.

Different nations view drone technology differently: some see them as weapons, while others see them as aircraft. Furthermore, police are beginning to deploy drones in their daily operations "INTERPOL Innovation Centre Director Anita Hazenberg noted. "This conference has assisted in connecting these varied perspectives, revealing similarities, and exchanging best practices throughout the global community on how to consider drones as a threat, tool, and source of evidence in police investigations all at the same time.

The symposium builds on the findings of INTERPOL's Drone Working Group meetings in late 2017 and early 2018, which laid the basis for the gathering of information on the challenges and opportunities that drones present to law enforcement. Over the last decade, drones have quickly become a tool in the arsenal of police and other law enforcement groups. Last year, Drone Watch, a campaign group, collated data on police usage of drones in the United Kingdom. The reply of 48 police departments to FOIA requests exposed the entire breadth of this crisis. Drones are now owned and operated directly by 33 regional forces. Three other people said they use drones owned by other law enforcement or fire departments. Many police departments have acknowledged that they employ drones for covert surveillance. More than 20 drones are used by the Metropolitan Police Service (MPS).

In the United Kingdom, law enforcement agencies are caught between growing expectations of their abilities to investigate, prevent, and punish crime and inadequate resources to achieve those lofty aims. In this context, they are studying how new technology may help them perform their work to the standards anticipated by the public and legislators. Drone technology has already been shown to be beneficial in a wide range of police activities, including the search for missing people and violent offenders. The rapid pace of development, on the other hand, raises issues. The premature deployment of this technology may have unintended consequences for civil liberties, data security, and national security. Terabytes of data can now be electronically stored and handled on distant servers in unknown jurisdictions. As technological advances broaden the possibilities available to law enforcement, it is vital that legislation governing its use keep up if public trust and, as a result, the highly valued paradigm of policing by consent is to be sustained in the future.

#### **8. Drones have the potential to be used for effective crime prevention.**

Tackling crime is growing more difficult for police forces all over the world, such as in the United Kingdom, where the number of police officers has declined by 14% in the last seven years. Officers routinely deal with challenging situations with people who may cause harm to themselves or others, and the end goal is always to minimise the risk to the public and the subject while maximising officer safety and bringing the crisis under control. In India, this approach has already been used, but it has to be organised more properly. Drones have been shown to be an excellent method for scouting crime scenes from a distance, whether for safety or tactical reasons. They can assess the risk level and gather information on the suspects identify and movements, whether he or she is armed, a possible escape route, and nearby cars. Officers can successfully put together a plethora of critical bits of information using drone imagery and analytics to deploy smart, tactical plans. Drone use has increased by 518% in the last two years, with 347 agencies in the United States alone using drones for tactical purposes. Other countries' law enforcement systems are not undermining ours, but rising drone technology does help crime prevention.

#### **9. Security at correctional institutions**

Drones have long been a source of concern in prisons. Drone smuggling operations are becoming a rising source of concern for correctional facilities around the world. Smuggled drugs, guns, cell phones, and other contraband passes through the facility's walls. Drone-related criminality has grown to be a serious cause of concern. As drone technology increases, so does the risk. According to statistics, jails, and correctional facilities face significant and growing challenges in protecting their facilities from drones. Drones are routinely used to monitor, control, and transport explosives as well as to supply contraband to inmates. A crucial component of security and crime prevention is preventing the use of drones to bring narcotics and weapons to prisons and other facilities. Kvertus Technologies is a manufacturer of creative and powerful drone weaponry, anti-drone systems, signal jammers, and other products. By blocking the control signals, we can deactivate a



drone using our technique. Drone countermeasures are used to silence signals, shut them down, prevent photo and video data transfers to the operator, and compel the operator to lose control. Interference systems, in other words, prevent UAV frequency emissions in a given sector or region.

**10. Examples of Drone Search and Rescue.**

In April 2019, the Collier County (Florida) Sheriff's Office used six drones to aid in the hunt for a 77-year-old man who had gone missing after straying from his home for more than two hours. The search area was divided into six grids, each with its own drone. Police discovered the man and brought him to safety within 30 minutes. The Fremont (California) Police Department utilised a drone in August 2019 to locate a Deaf 17-year-old teenager who had run away from school. The search took place at night, and authorities utilised the infrared camera on the drone to locate the youngster in a field and securely recover him.

**11. Drone in charge of the legal system. Is it legal in India to fly a drone?**

In a public notice issued on October 7, 2014, the DGCA (Director General of Civil Aviation) prohibited the launch of any UAV (Unmanned Aerial Vehicle) by any non-governmental entity or individual. As a result, flying drones without first obtaining permission from governmental authorities is illegal in India. Additionally, the Ministry of Trade and Industry's Directorate of Industry Policy & Promotion issued Press Notice No. 3 (2014), which defined a list of electronic aerospace and defence equipment that required an industrial licence for manufacturing/production. Unmanned aerial vehicles (UAVs), sometimes known as drones, are included. Drones were mostly used in military or defence operations. When the goal of their use changed over time and drones were used for commercial purposes, the government identified a security risk from these UAVs and prohibited their flying without license.

The 1934 Aircraft Act defines "aircraft" as any vehicle that can get support in the atmosphere through air reactions [other than air reactions against the earth's surface], which includes fixed and free balloons, airships, kites, gliders, and flying machines. This is a broad enough definition to include unmanned aircraft. Under the Aviation Regulations, 1937, the DGCA has the ability to issue notices to aircraft owners and specific orders relating to the operation, usage, custody, maintenance, or navigation of aircraft flying in or over India or aircraft registered in India. According to Rule 30 of the Aviation Regulations, the Central Government will issue the certificate of registration to an aircraft. Unmanned Aerial Vehicles, Unmanned Free Balloons, and Remotely Piloted Aircraft are all examples of aircraft. As a result, drones must be registered in accordance with the criteria mentioned below. Regulations 31 through 37A include the legislation governing aircraft registration, cancellation and change of ownership, nationality, and registration marks, as well as how they are to be affixed.

**Table-3. Authorized Incidence for Usage of Drone.**

Search and Rescue	Crime Scene Photography and Reconstruction	Investigating Armed and Dangerous Suspects	Disaster Response	Traffic Collision Reconstruction	Bombs and Hazardous Materials Observation	Fugitive Apprehension	Crowd Monitoring (e.g., outdoor music festivals)	Surveillance (e.g., general surveillance of high-crime areas)	Other
90.82%	84.69%	83.67%	83.67%	80.61%	68.37%	63.27%	51.02%	26.53%	14.29%

**12. Sections 287 and 336 of the Indian Penal Code**

Under Section 287 of the IPC, "negligent behaviour on machinery" is given a definition. "Negligent behaviour with relation to machinery" refers to any situation in which a person uses a machine in a way that is either reckless or irresponsible, and as a result, puts the lives of other people in danger. This section will come into play in the event that a person is flying a drone when a technical issue occurs, causing the drone to crash and putting other people in danger. The penalty for violating this provision is a fine of INR 1000 in addition to a jail sentence of six months. An "act threatening the life or personal safety of others" is referred to in section 336 of the International Criminal Code. Whoever commits any conduct in such an irresponsible or careless manner as to put the human life or the personal safety of others in jeopardy shall be punished with imprisonment of either sort for a term of up to three months or with a fine up to two hundred and fifty rupees, or with both, depending on the severity of the offence. The phrase "Public Nuisance" can be found in section 268 of the IPC. When a person commits any act or commits an illegal omission that causes any common injury, danger, or annoyance to the public or to the people in general who dwell or occupy property nearby, or which must necessarily cause injury, obstruction, danger, or annoyance to persons who may have occasion to use any public right, that person is guilty of committing a public nuisance. A public nuisance can be prosecuted in the same manner as any other crime. In accordance with the provisions of section 319 of the IPC, a drone carries the

potential to cause injury. One is said to have caused injury to another when they caused them to suffer from physical pain, illness, or infirmity.

According to Rule 5, (a) of the Drone Regulations, 2021, nano drones that weigh less than 250 grammes are permitted. These incredibly small drones can easily infiltrate anyone's person or property and collect photographs and videos of them. In March of 2021, the Unmanned Aircraft Systems Regulations, 2021, also known as the UAS Rules, 2021, become legally binding. Rule 27(h) of the Unmanned Aircraft Systems, Regulations of 2021 requires the operator to preserve the privacy of people and property while conducting operations, and Rule 39(2) requires the drone operator to protect the privacy of people and property when obtaining video footage or still photographs. These laws are no longer in effect because they have been replaced by the Drone Regulations of 2021, which do not contain these safety precautions. Does this imply that the operator of a drone is no longer responsible for protecting the privacy of individuals and their property when the drone is in operation? It would appear that this is the case.

Despite the widespread adoption of this technology, there is currently no particular legislative framework in place to govern how it can be used by law enforcement. This is in stark contrast to the situation in the United States, where, despite the fact that the laws governing the use of drones in policing have undergone significant changes despite the fact that the circumstances vary from state to state. At least eighteen states have implemented laws that make it mandatory for law enforcement to get a warrant before conducting an investigation. The Civil Aviation Authority (CAA) oversees regulating the operation of drones in this region.

Operators of drones are required to earn a qualification that is nationally approved by the CAA, and commercial drone activities need a specialised authorisation from the CAA. When an operator obtains permission, they are granted the ability to fly their drones over populated areas, as well as over people and their property, provided that they adhere to certain extra restrictions and maintain a certain minimum distance between each drone. Drones are only allowed to take off and land with a human at the controls; pilotless flight is prohibited. Self-assessment tools like the one provided by the Surveillance Camera Commissioner (SCC) are available for drone pilots who want to verify that their operations are legal and in compliance with the Surveillance Camera Code of Practice (the Code). Also, the SCC has developed a certification process that is available to participation from any entity that operates surveillance cameras in public areas. According to the Code, surveillance cameras must always be used for a specified purpose, pursue a legal goal, and be required to meet a recognised, immediate necessity. These three requirements must always be met. Images and information should not be stored for any longer than is strictly necessary for the surveillance camera system to perform its stated purpose, and such images and information should be destroyed after the aim has been accomplished once that goal has been fulfilled. Safeguards are typically a component of the law when it comes to protecting personal information. The processing of personal data for the purposes of law enforcement is governed by Part 3 of the Data Protection Act of 2018, which was passed in 2018. There are six different data protection principles that need to be adhered to. The processing that is done by law enforcement needs to be lawful and fair (the first principle), particular, explicit, and legitimate (the second principle), adequate, relevant, and not excessive (the third principle), and accurate and up to date (the fourth principle) (the fourth principle). The information must be kept in a safe location and for no longer than is required (the fifth principle), and the Information Commissioner's Office (ICO) will release a report on the data processing practises of the police in July 2021. According to the findings of the study, more than 75 percent of the police forces that were investigated either did not have a documented record of all processing actions in line with UK GDPR and DPA 2018 or had an incomplete record of such actions. In every instance, it had not been determined what the legal grounds for processing were. In several departments, there was a lack of evidence that personnel had received, reviewed, and comprehended critical modifications to data protection policies and procedures.

The Information Commissioner's Office (ICO) has developed its very own code of practice regarding the use of surveillance cameras and personal data. According to this guidance, anyone who flies drones needs to present a convincing justification for their activities and a detailed explanation of the privacy risks associated with doing so. Operators of drones need to think of creative ways to monitor people without their being aware of it, but they also need to find a way to make sure that people are aware that they are being monitored. The Information Commissioner's Office has not issued any specific guidance on the application of this technology in law enforcement, nor has it recorded any enforcement action against a law enforcement agency that involves the use of drones.

### **13. Summary.**

The drone's cameras are used for night vision, thermal sensing, chemical detection, and facial surveillance. Thermal drones may be outfitted with vision imaging cameras capable of detecting hot materials and systems. With such sensing abilities, the operator can manually shut down the drones to prevent them from being destroyed. Some sensors have night vision, allowing authorities to identify criminals who commit crimes at night. In order for the drone to take images at night, the sensors must be capable of night vision. Thermal drones may be outfitted with vision imaging cameras capable of detecting hot materials and systems. With such

sensing abilities, the operator can manually turn off the drones to avoid destruction. Some sensors have night vision, allowing authorities to identify perpetrators of criminal activities at night. In order for the drone to take images at night, the sensors must be capable of night vision. Chemicals might cause the system to fail, therefore detection is also essential. Sensors in facial surveillance systems can capture real-time face recognition, assisting in the identification of criminals. Sensors are more effective when drones have a 1080p camera and a GSP location framework that shoots well-defined images.

The law enforcement profession is data-driven. Drones can be employed as airborne surveillance equipment to gather information for crime prevention, detection, and/or investigation in the interest of national security. The use of drones by law enforcement for search and rescue, crime scene investigation, and hostage situations are not controversial in most cases. Police use of drones for crowd monitoring and protests, on the other hand, may be contentious because it may violate several human rights, including the right to privacy, which includes data protection, free expression, the freedom to demonstrate, and the right to move freely. These rights must be balanced against the safety of the broader population. The debate focuses on identifying ethical and legal issues with police drone use and how to overcome these concerns. It highlights that the issue is not the drone technology itself, but how it is used, as well as how authorities handle, process, and act on information gathered in order to prevent or control crime. The use of drone technology for surveillance has an influence on human rights. If safeguards to limit omnipresent surveillance are not in place, surveillance may manifest itself in state rule and authority. Domestic drone policing should be evaluated to determine whether the disadvantages outweigh the benefits of using it for public safety. The manner in which these issues are resolved could serve as a model for governments considering the use of drones for law enforcement.

Law enforcement and public safety agencies can employ drones for a variety of objectives, including search and rescue missions, crime scene photography, and reconstruction. For many applications, their use is a less expensive option than manned aircraft, which can be up to ten times more expensive to deploy. Public agencies are rapidly adopting commercial drone models as platform capabilities improve and costs fall. While the benefits of UAS are numerous, their application remains difficult. Drone programmes can be prohibitively expensive to undertake for public safety authorities. This comprises not just the unit's purchase price, but also the cost of training, programme administration, data management, and storage. Furthermore, if the community's concerns about citizen privacy and safety are not addressed in advance, agents may face a considerable public backlash if they use drone platforms. Most importantly, the lack of a clear regulatory framework governing drone usage by law enforcement agencies causes officers to be cautious to implement drone programmes in their respective departments until prohibitions are removed and bureaucratic permit clearance processes are simplified. This study examines the significance of drone platforms for law enforcement agencies worldwide, as well as potential opportunities for UAS industry companies interested in entering this market.

With such sensing abilities, the operator can manually turn off the drones to avoid destruction. Some sensors have night vision, allowing authorities to identify perpetrators of criminal activities at night. In order for the drone to take images at night, the sensors must be capable of night vision. Chemical detection is also essential because chemicals can cause the system to malfunction). Sensors integrated into facial surveillance systems can capture real-time face recognition, assisting in clearly identifying criminals. Sensors are more effective when drones have a 1080p camera and a GSP location framework that shoots well-defined images. Drones can simply be used to examine crime scenes and offer three-dimensional images in a shorter length of time. These would be useful even in heavily populated regions because they provide more information and can monitor people in real-time. Drones with high autonomy and pilot control could detect dangerous actions before they escalate. Agents of law enforcement in pursuit can communicate swiftly with one another.

The use of drones by law enforcement creates severe privacy and trust concerns. Many people rightly worry that anyone, including police enforcement, will be able to fly small, lightweight drones mounted with video cameras virtually anywhere they want. Many people are also concerned that police agencies may use drones to obtain evidence in ways that go against the law's restriction on excessive searches and seizures. These are complex issues, but they are comparable to those faced by police managers when dealing with other new technologies in the past. The goal is to begin the process by soliciting community opinion and involving interested stakeholders in the development of policies and implementation plans. Because not everyone has the time to attend public hearings, police departments considering the use of drones for public safety should hold public hearings as well as provide other channels for community members to share their thoughts, such as a dedicated email address or another online system for taking comments. Authorities should submit early plans for a drone programme, listen to community concerns, modify their plans as appropriate, and continue with caution with a drone programme. Many of the problems that police agencies should address are addressed in this document, such as what types of occurrences and scenarios drones will be used for, what video or other information will be taken and stored (if any), how data will be protected, and who will have access to it.



**Reference lists.**

- [1]. Dr. Swati Withal, Application of Drones in the Investigation and Management of a Crime Scene, Gjra - Global Journal for Research Analysis.
- [2]. Lim H, Park J, Lee D, Kim (2012) Build your quadrotor: Open-source projects on unmanned aerial vehicles. IEEE Robotics & Automation Magazine 19(3): 33-45.
- [3]. Khalid A, McFall K (2014) Aerial robotic autonomous patrol and surveillance system. 14th AIAA Aviation Technology, Integration, and Operations Conference 1-10.
- [4]. Perez D, Maza I, Caballero F, Scarlatti D, Casado E, et al. (2013) A ground control station for a multi-UAV surveillance system. J Intelligent Robot System 69: 119-130.
- [5]. Dong M, Chen BM, Cai G, Peng K (2007) Development of a real-time onboard and ground station software system for a UAV helicopter. Journal of Aerospace Computing, Information, and Communication 4: 933-955.
- [6]. Giyenko A, Palvanov A, Cho Y (2018) Application of convolutional neural networks for visibility estimation of CCTV images. In: International Conference on Information Networking, Chiang Mai, Thailand, pp. 875- 879.
- [7]. Gupta BB, Quamara M (2018) An overview of the internet of things (IoT): Architectural aspects, challenges, and protocols. Concur Computer Practical Exp 32(21): 1-2.
- [8]. Nur Ibrahim AW, Ching PW, Gerald Seet GL, Michael Lau WS, Czajewski W (2010) Moving objects detection and tracking framework for UAV-based surveillance. 2010 Fourth Pacific-Rim Symposium on Image and Video Technology, Singapore.
- [9]. Ali S, Shah M (2006) Cocoa-tracking in aerial imagery. Airborne Intelligence Surveillance Reconnaissance (ISR) Systems and Applications III 6209: 62090D- 62096D.
- [10]. 15. Harris C, Stephens M (1988) A combined corner and edge detector. Alvey Vision Conference 15: 147-151.
- [11]. Fischler MA, Bolles RC (1981) Random sample consensus: A paradigm for model fitting with applications to image analysis and automated cartography. Communications of the ACM 24(6): 381-395.
- [12]. Bradski G (2000) The OpenCV library. Doctor Dobbs Journal 25: 120- 126