

Drones: Privacy, Cybersecurity, and Ethical Concerns

By

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Introduction

Unmanned Aerial Vehicles (UAVs) have been operating for over 70 years. Originally, they were used by the military as well as some other governmental agencies. Now, they are also used by private industry such as television stations to show aerial views and hobbyists. They have provided aerial views of our neighborhoods. UAVs have carried cameras and other sensors, providing a “bird’s eye” view. The need for information has increased for military activities, mapping our terrain, city building, farming, weather and disasters. Drones (or UAVS) have evolved becoming smaller and more specialized. “The market for drones used across all sectors is expected to reach \$141 billion by 2023, with the commercial drone market size making up at least \$17 billion of that.” (Beware, 2019). In this paper we will examine some of the benefits of drones as well as some of the possible issues with drones such as privacy, cybersecurity, and ethics.

The Military

The military has special airports and landing sites on ships to land and take off. They have computers to operate the drones with sensors to collect the data. When the price of purchasing one became reasonable, individuals bought recreational drones. They have purchased

them for personal use as well as to use them in competitions. The air space will inevitably become more crowded. What will the drone activity be like in the next 10 years?

The Civil Air Patrol (CAP) is an auxiliary of the United States Air Force. Formed in 1945, the CAP's three missions include: search and rescue operations, youth leadership, and promoting civil aviation. Today, CAP has an extensive aerospace education program to use with CAP cadets and schools all over the United States. One can learn more about becoming an aerospace educator at this CAP website: <https://www.gocivilairpatrol.com/programs/aerospace-education/for-educators> . Teachers can join for a one-time fee of \$30 and become an aerospace educator member. The Unmanned Aerial Vehicle activity booklet is available to members. In addition, free STEM publications, activities, and equipment are available for use in the classroom.

The word, "drone," has a military connotation that the public associates with missiles that are directed to destroy military equipment and kill combatants. Over 10 years ago, kids often had remote controlled toy helicopters and airplanes. However, nobody called them drones. Drones have the connotation of someone snooping around. Thus, CAP tends to use the term small UAVs instead of drones.

Military drones exist that can spy for us or even be used in combat. They come in fixed wing, helicopter, and quad-copter configurations. Drones are likely the most advanced equipment in the field of robotics, aeronautics, and electronics. The technical use of drones is "Unmanned Aerial Vehicles (UAVs)." They are aerial vehicles, which come in wide varieties, sizes, shapes and functions. UAVs are controlled either remotely or by control systems from the ground. They are used in operations that are considered risky to manned flights. Civilians use drones in a variety of ways including search and rescue operations and weather analysis.

Hobbyists/Agencies

Hobbyists have assembled small drones with the desire to fly them every weekend. For about \$300, one can purchase the Parrot AR.Drone. You use your phone to control the flight of the drone. The AR.Drone is smart enough to land and take off by itself. It will hover in one place when you take your hands off of the controls. Finally, it stops flying away from you if it goes out of range from your phone. It can take pictures or videos. For example, one local Saint Louis news channel, uses a drone to fly over select areas in the region. Today, drones are used to monitor ports, airports, nuclear power plants and other sensitive areas to prevent terrorist acts. They can monitor how fast a forest fire is spreading. They are used to cover rugged terrain as well as large swaths of land to find missing persons. Most of the world today has laws and regulations monitoring the flight of drones.

UAV Safety

The Academy of Model Aeronautics national Model Aircraft Safety Code applies to all pilots using Remote Controlled Aircraft, which includes drones. The private sector has established the Safety Code, which takes into account the Federal Aviation Administration (FAA) regulations. The Safety Code addresses not only the pilot but also people, buildings, cars, etc. which may be damaged when a drone goes down. Also, included in the rules are refraining from flying near power lines. We will not go into all of the constraints, but a few of the rules are that drones are not to be flown in a careless or reckless manner. They are not to be flown higher than 400 feet above the ground nor near an airport. Drone pilots are expected to adhere to this Safety Code.

However, even with these rules in place, some individuals ignore them. On Tuesday, August 4, 2020, during the Minnesota Twins and Pittsburgh Pirates game a drone appeared above center field in the fifth inning. Out of concern for safety that the drone might hit one of the players or crash onto the field, the umpires suspended play for eight minutes until the drone disappeared. (St Louis Post-Dispatch, 8/5/2020, p B4)

Some Real World Applications – Drones in Agriculture

Brazil is one of the major agricultural countries in the world. As drones fly over fields, they can gather data on crop diseases, water stress, nutrient deficits, and environmental damage. In Brazil, drone technologies are used to improve crop production and lessen the impact on the environment. Thus, drones can have a powerful positive impact on agricultural yields.

Some Real World Applications – Drones and Hurricanes

The National Oceanic and Atmospheric Administration (NOAA) sends disposable drones deep into storms, where it is too dangerous for crewed airplanes. A coyote is one example of these type of drones. Coyotes are small drones weighing about 13 pounds and having a wingspan of five feet. They can fly for about an hour, and they can operate up to 35 miles away. Coyotes can determine the radius, top speed, and exact location of a hurricane's maximum winds. These data are crucial to forecasting potential wind damage, storm surge and can have a major impact on evacuations.

Some Real World Applications – Drones and the Police

Drones can easily travel to locations which are too difficult or dangerous to reach for human beings. They can collect images from a bird's-eye view through aerial photography.

Enabling drones to identify people on the ground is important for a variety of applications, such as surveillance, people search, and remote monitoring.

The benefits of using drones rather than traditional helicopters for police purposes are evident. Drones are cheap. They are accessible to many users. They can blanket an entire city, and they are much quieter than helicopters.

Some Real World Applications – Drones as Delivery Vehicles/Monitor

Some pilot cases are occurring in which drones are used to deliver pizza for Dominos, books for Amazon, and medicines to their intended recipient.

Also, wildlife can be monitored tracking their migration across lands. This can help researchers understand animal movement and possibly help to preserve them for future generations.

Some technical and societal concerns and challenges that need to be examined are in the areas of privacy, cybersecurity, and ethics.

Privacy

What are the misuse of drones by government agencies and others? The main issue involves privacy concerns? Included are issues involving unauthorized surveillance, flying over private property without permission, the expectation of an individual's right to privacy, and the usage of drones by the police.

While the applications for drones in an industrial setting are vast and quite useful, there is still the issue of privacy. In 2013, FBI Director Robert Mueller admitted that the FBI was using drones to carry out surveillance on U.S. soil. In 2018, Bard College published a report that

showed 910 law enforcement agencies and emergency services in the U.S. had purchased drones. Now, governments all over the world routinely use drones.

Civil rights and liberties groups such as the Electronic Frontier Foundation (EFF) have raised concerns about the state use of drones in surveillance. These groups and others asked for tightened controls on the use of drones in order to uphold the right to privacy of the individual. Some legislation has been passed, but given the rapid development of technology, the legislation has become obsolete.

Suppose that a drone flew over your backyard while you were sunbathing or watching your children play. Would this concern you? Your answer might depend on who was flying the drone and for what purpose. Like most people, you probably have a desire for privacy. You would want to be assured that regulations were in place that would insure privacy (Rice, 2019).

However, Federal Aviation Administration regulations do not specifically address flight over residential areas. Dr. Ryan Wallace, assistant professor of Aeronautical Science at Embry-Riddle Aeronautical University (ERAU) states, "So long as the UAS operator is compliant with operational restrictions, there are no federal restrictions regarding overflight of residential areas." (Rice, 2019)

In general, the public support police using drones to apprehend criminals. But they dread the police using drones to spy on them. Dr. Winter's research showed that the latter scenario generates fear of the police (Rice, 2019). In fact, "On average, females have more privacy concerns about drones" (Rice, 2019).

There are two overarching privacy issues concerned with domestic drone use. The first issue pertains to which government agency should be responsible for regulating drones and privacy. (Thompson, 2015)

The courts are the final arbiter of the Constitution and they should provide at least the floor of privacy protection from UAS surveillance. “In addition to the courts, the executive branch likely has a role to play in regulating privacy and drones. While the FAA has taken on a relatively passive role in such regulation. Former President Obama’s privacy directive for government drone use and multi-stakeholder process for private use creates an initial framework for privacy regulations. With its power over interstate commerce, Congress has the broadest authority to set national standards for UAS privacy regulation.” (Thompson, 2015)

The second overarching issue is defining what “privacy” means in the context of aerial surveillance. But, there has been no general agreement on this. This has turned out to be a thorny problem.

Besides privacy concerns, issues involving cybersecurity exist.

Cybersecurity

The Federal Trade Commission (FTC) has described several vulnerabilities in the use of drones. One of these involves hackers taking control of drones and its flight. Another is that a hacker may have access to the camera feed of a drone.

When there is a mishap involving a drone, there may be confusion who has jurisprudence to address the problem. Suppose that a mishap occurs in one county. The person controlling the drone is in another county. Which county has jurisdiction over the mishap? It is not clear

whether drones can fall under the current jurisprudence. What information falls within the scope of that expectation (Koerner, 2015).

Congress enacted the FAA Modernization and Reform Act of 2012 (FMRA), calling for the integration of unmanned aircraft systems (UAS), or “drones,” into the laws of the national airspace by September 2015. However, Congress has enacted no law explicitly regulating the potential privacy impacts of drone flights. The courts have not ruled on the constitutionality of drone surveillance, and the Federal Aviation Administration (FAA) did not include privacy provisions in its proposed rule on small UAS.

Congress has held hearings and introduced legislation concerning the potential privacy implications of domestic drone use. In 2015, President Obama issued a directive to all federal agencies to assess the privacy impact of their drone operations; and since then, almost half the states have enacted some form of drone legislation (Thompson, 2015).

In addition to privacy and cyber security issues, there are ethical concerns.

Ethical Concerns

The central ethical dilemma when involving a human subject in research is the potential conflict between protecting his/her rights and welfare and advancing scientific knowledge (Resnick, Elliott, 2019). When drones are used to study human beings, this can present ethical issues. For example, is data being collected that pertains to privacy, confidentiality, and consent? The issue comes down to whether research involving drones counts as Human Subject Research (HSR). Would an Institutional Review Board (IRB) rule it is non-HSR, exempt HSR, or non-exempt HSR? Can informed-consent be waived?

Drones are increasingly becoming big data collection platforms and when they become integrated with additional technologies and systems, they could pose some ethical concerns. For example, integrating drone data with social media data in crisis informatics can raise significant issues around identifiability, discrimination, equality and the digital divide (Finn, Donovan, 2016).

With drones becoming smaller, lighter, and easier to control, they are integrating different types of sensors (Finn and Donovan, 2016). When drones are combined with Graphical Information Sensors (GIS) for navigation they can also include temperature sensors. They can collect and transmit mobile phone data.

Conclusion

Ann Cavoukian, ex-privacy commissioner for Ontario, in her treatise (2017), “Global privacy and security, by design: Turning the ‘privacy vs. security’ paradigm on its head” looked at the misuse of drones. She summed it up by saying that “privacy and public safety can indeed co-exist, resulting in greater efficacy for both.”

In 2017, the FAA saw 1.1 million drones registered with their organization, and they predict the numbers to increase to around 3.1 million by 2022. Drone users need to insist that certain basic security criteria are met. This includes using robust encryption. Other areas, like password hygiene and firmware updates, should be part of the general ownership routine that a responsible drone owner performs. Drones, while they can be used for the betterment of the society, can also be used by malicious entities to conduct physical and cyber-attacks, and threaten society.

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