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Counter-drone Technologies

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Unmanned aircraft systems (UAS), commonly called drones, have a host of applications including law enforcement, wildlife tracking, search and rescue operations, disaster response, border patrol and recreational use. Drones have become a part of our daily lives, especially among drone hobbyists. Just as with any form of technology, drones can be good or bad depending on the purpose of the people flying them. Anti-drone systems are more relevant nowadays than one might assume. There are some evident reasons, such as a launch of drones near airports, which have caused hundreds of flights to be canceled over the past couple of years. Also, there are important objects that cannot be made photos of.

Between 19 and 21 December 2018, hundreds of flights were cancelled at Gatwick Airport near London, England, followed by the reports of drone sightings close to the runway. It was the biggest disruption at Gatwick since its closure following the 2010 volcano eruptions in Iceland [1].

A drone dropped a package of drugs into a prison yard while inmates were outside, sparking a fight at the Mansfield correctional institution in Ohio. Correctional officers managed to bring the fight under control with the use of pepper spray. They had to strip-search nearly 200 inmates to find the drugs, and the nine prisoners who were mainly involved in the fight were placed in solitary confinement [2].

Drone monitoring equipment can be passive (simply looking or listening) or active (sending a signal out and

analysing what comes back) and can perform several functions, including detection, classification or identification, locating and tracking, alerting [3].

Detection alone usually isn't enough though. A radar that detects drones may also detect birds, for example. That's why classification is useful. Technology that classifies drones will usually be able to separate drones from other types of objects - like planes, trains, and automobiles, for example [3]. One step further is identification. Some equipment can identify a particular model of drone, or even identify the drone's or controller's digital fingerprint, like a MAC address. This level of identification can be handy for prosecution purposes [3].

Being alerted that a drone is present somewhere in the vicinity is already useful. But situational awareness, and ability to deploy countermeasures is greatly enhanced if you know the drone's (and/or the controller's) exact location. Some equipment will even allow you to track the drone location in real-time [3]. There are four main types of drone monitoring equipment: radio frequency, analysers, acoustic sensors (microphones), optical sensors (cameras), radar. Countermeasures can be grouped as either: physically destroying the drone, neutralising the drone or taking control of the drone [3]. It's important to note that, although the technology is available, current regulations in most countries forbid the use of many technologies (e.g., high power microwave devices or high-energy lasers) to be used for neutralising drones. Exceptions are sometimes made for military or law enforcement agencies.

One of the interesting solutions to the drone problem is birds of prey. Eagles have been trained to capture S-UAS and COTS drones. Birds have been used for hunting by man for thousands of years. This solution takes advantage of the natural hunting instincts of the eagles being used. This can be a low-

tech solution but requires a lot of manpower for training (at least 1 year per bird) and for maintaining the birds of prey [3].

The Kaspersky Antidrone hardware and software system protects the airspace over civilian sites and large gatherings from unmanned aerial vehicles. The stand-alone Kaspersky Antidrone solution uses a neural network to instantly detect and classify drones in automatic mode. Data on the drone model, remote control console, and the location of the drone pilot is displayed in real time. Sensors, selected specifically for each site in combination with AI-based technology, signal that a drone is approaching the controlled zone and pursue the target [4].

Kaspersky Antidrone uses machine learning and neural networks to classify detected targets, determining the type and model of a drone in less than one second. Data is displayed on the user interface, where the system signals any unauthorized flights and offers a choice of countermeasures [4].

References:

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