Alternative Option for Negative Drone Usage

Kris Russell

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Professor Ric Stephens

Drones can be extremely helpful, useful, and fun, but what happens when they are used for the wrong purposes? The lightweight, quick set up, and modularity of many small privately purchasable UAS (unmanned aerial system) is both a huge benefit, but when used with more nefarious motives, can be something not easily dealt with, especially by law enforcement, military, or civil aviation authorities. A variety of options to respond to nuisance drones, or drones being used for illegal activities should be considered, especially dependent on the level of danger or risk, location, and the operator.

With the prevalence of drones in the hands of a multitude of people, there will be some small sliver of that population who uses drones for negative reasons, whether this be illegal surveillance, spying, endangering others with improper flight, or in some cases even use by terrorists and the like. You can recall the news headlines when ISIS was using drones with modified grenade rounds and shuttlecock flights to create a loitering attack system against the Kurds and Iraqi Security Forces in the Middle East.

How can you stop a nuisance drone? Military and other high dollar end users have access to multiple levels of drone detection and deterrence. From large radio antenna arrays that can track a drone in flight and various jammers, even the DroneGun, a handheld rifle style jamming device, or a net launcher that looks more like some form of sci-fi bazooka. The drone gun has a 1.2 mile claimed range but with the size and price being prohibitive to personal ownership, likely will only be a purchase for large agencies with a specific need. But the average citizen or police department may be limited by budget on those options. The DroneGun, also known as DroneShield, essentially causes an interruption or jamming of the signal between the drone and the receiver, which will (on most models) cause the drone to self-land immediately or return to its receiver/controller. A person without authorization cannot (should not) openly use what some people have thought of like using a shotgun to shoot down

an offending drone. It may not be doing what they think it is, also typically within city limits it is both illegal and irresponsible to discharge a firearm, and if someone misses said drone, they could potentially negatively influence other lives or property.

Another alternative anti-drone weapon is the Skywall 100 which is a large compressed air powered, net launching device that seems more at home in a science fiction movie or a video game. Limitations of such a device are again size, portability, and cost. Another significant limitation is the range, the net launcher only has a limited effective range. While it can be quickly reloaded, if there are multiple drone targets, and also has a radio transmitter to not only track the drone but to also analyze the movements of it and ensure an accurate, well-aimed shot when attempting to take the drone down, it also keeps the drone one piece upon impact and allows it to be recovered for further analysis, if necessary.

The author's opinion is that a small, cheap, affordable and handy UAS would be the perfect response to many of these situations. With a small lightweight drone, with a payload to end the operability of the most popular UAS options on the market, the quadcopter, you could theoretically, quickly and easily stop an offending UAS system without much of a hassle or the legality problems with using a firearm or other type of much more destructive and dangerous responses. My idea is to use an extremely small, quick, and controllable UAS similar to the FLIR Black Hornet, which would carry a small pouch or dangling payload of Kevlar fibers, similar to the pants worn for protection from accidental chainsaw cuts. The small UAS would fly into the rotors of the offending UAS, and the fibers would become entangled into enough of the rotors to bind them so the UAS would plummet to the ground. This would allow authorities to check the UAS for any information that could lead to the arrest or penalty of the offending UAS' owner for possible criminal or civil charges. I'm not sure if a loose dangling group of Kevlar fibers would be better, or a loosely bagged portion that would rip open when it came into contact with the rotors. It would have to be a long enough amount to come into contact with at least two of the rotors,

to cause it to lose lift and drop in altitude. I think for larger UAS quadcopters, like 6 or more motors, a larger clogging type of Kevlar bag would be necessary, but also in that respect, a larger UAS is significantly more expensive, and less likely to be used for negative purposes as the more commonly accessible and lesser cost UAS equipment may be.

While I do not have the specifics of the cost on the FLIR Black Hornet UAS, something significantly less costly would be ideal, especially if with the attached payload, it was going to plummet to the earth attached to a larger quadcopter. If it was too costly, it would be an issue with getting it into the hands of people who were worried about quadcopters spying on them illegally, or into the hands of smaller agencies as well. The benefit of a low-cost device would be, more widespread availability, but also if it was destroyed or damaged in the process of using it, it would be no great loss on the end user's budget.

Drones can be one of the most cost and efficient and multiuse tools for hobbyists, for mapping or photography, and also for agency use such as search and rescue operations. While the benefits are numerous and extensive, in the wrong hands or used for ulterior motives, a drone can also turn quickly into a pesky nuisance, or even a life-threatening problem when flown near people, or aircraft, or when used for payload-carrying of dangerous dropped items such as the ISIS weaponized drone systems. People should have access to protection from such threats, and a low-cost solution would be ideal so it can be easier accessed by the multitudes of people concerned with the illegal use of unmanned aerial systems, large or small.

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