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ROBOT WARS: THE TECHNOLOGY STRIKES BACK

— Mary (Missy) Cummings

In just the past two years, it seems as if drones are everywhere in the news. This technology has been around for more than 60 years, but has only recently captured both national and international attention. This is primarily because of the increasing use in the military, but also because of concerns that such technology will be turned on a country's own citizens.

The average person thinks of a drone as a flying spy camera, loitering overhead waiting to spot a target and then possibly launching a weapon when that target is labeled as a threat. To be sure, this is indeed one mission of drones, typically of organizations like the CIA.

However, this is by far the least common mission. The vast majority of military drone missions today are data and image collection. Their ability to provide "situational awareness" to decision makers on the ground is unparalleled in military operations since drones can essentially conduct perch and stare missions nearly endlessly.

This is why their use and demand from the trenches has been so high – they provide an ability to watch events unfold, providing some clarity to the fog of war, which is the Achilles Heel for military leaders.

However, in the very near future, these intelligence surveillance, and reconnaissance (ISR) missions will be dwarfed by other uses of drones in operations inconceivable to most military personnel today.

They will be used to enhance communications, patrol the skies, intercept incoming ballistic and short range missiles, dog fight with other aircraft in the sky, and deliver supplies. Indeed, the US Marine Corps presently has two robotic helicopters that have moved

millions of pounds of goods and have been critical in current drawdown efforts.

One of the most dramatic future missions of drones is the effort to move the locus of control of Close Air Support (CAS) missions from pilots to operators on the ground. In the past, operators on the ground under imminent threat would have to navigate a complicated command hierarchy to call for air support.

The soldier on the ground would have to relay coordinates to a forward air controller (FAC), who would then talk the pilot's eyes onto a target in an extremely hostile environment. These missions have always been very dangerous for the pilot, who has to fly low and avoid multiple threats, and also for the people on the ground. It is a human-error rich environment, and even today, it is not uncommon for the wrong coordinates to be relayed, resulting in the deaths of friendlies.

In the very near future, the FAC and the pilot will be replaced by a weaponized drone that will be commanded by a soldier on the ground with a smartphone. This idea of drone control from a hand-held device will become ubiquitous in many other missions as well.

The Marine Corps and the Army are already working on developing robotic casualty and medical evacuation robotic helicopters that will be summoned from an app on a smartphone and will be able to land on mountain tops and in extremely bad weather – something no human pilot can reliably do.

This technology is developing rapidly, more rapidly than even the military can grasp. While the military has been the source of drone innovation for the

past 20 years, particularly in Israel and the United States, with the recent explosion of commercial applications of drones, I predict that in the next 20 years, the bulk of drone innovation will shift to the commercial market.

This truly disruptive technology will present not just new capabilities for militaries and governments worldwide, but also serious and unexpected challenges. If the technology becomes so cheap and accessible to the masses, what will this mean for terrorists and non-state actors? Security is already an issue, with GPS-spoofing relatively so easy that commercial off-the-shelf technology can be used to trick any aircraft reliant on GPS-guided technology (including commercial airlines) to a dummy destination.

One counter tactic to GPS-spoofing is the development of an even more autonomous drone that navigates with high precision without the use of any external sensors. Known as terrain relative navigation, there is significant research happening across the globe in open forums to allow drones to find their way to their destination without any human input or close monitoring.

This research is critical, particularly for those drone industries that want access to commercial airspace, but will ultimately mean that any drone can have this capability, friendly or not. While the US military is actively pursuing anti-drone defensive technologies, it is not keeping pace with the rapid advances happening outside the military sphere of influence.

Drones have flown the figurative military coop, and because of rapidly advancing commercial development, they will only become a more disruptive military technology in the future.

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