

Where the Hell Are the Drones?

Why Every Gunner Should Be a Remote Pilot

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INTRODUCTION

It is great to see that the Canadian Armed Forces (CAF) and the Royal Canadian Artillery (RCA) are finally embracing remote piloting with some deployment of relatively modern systems. However, those with the necessary skills and qualifications are limited. The small, unmanned aircraft systems (SUAS) themselves are even more scarce and unable to meet demandsⁱ. The CAF could do much more to keep pace with evolving methods of warfare which already includes widespread use of small drones.

Future warfare will, with certainty, include drones in very large numbers. The arsenal of other modern militaries and recent regional skirmishes have demonstrated this. The CAF must not lag behind; however, traditional procurement methods cannot hope to keep pace with this type of technology. In this article, I propose that the Regular and Reserve Artillery, combined with an expedited procurement process, be used to rapidly expand overall CAF remote piloting capabilities, build drone awareness, and become a centre of excellence for use of off-the-shelf/commercial drones in modern warfare.

SMALL DRONES AND THE MODERN BATTLESPACE

This article will focus strictly on small, rotary-wing, “quadcopter”-style drones which are low cost, commercially available, and being developed at a very fast pace. Normally operating strictly in visual line-of-sight (VLOS), these small drones have a payload capability of just a few kilograms. Larger, fixed-wing and fully autonomous drones, often armed and the subject of much ethical combat debate, are outside the scope of this paper.

These small commercial drones have been used extensively in combat in many recent conflicts, making them a new and integral part of modern warfare. Russian-backed rebels in Eastern Ukraine were among the first to be armed with many types of dronesⁱⁱ, forcing Ukraine to start its own, home-built drone program to respond.ⁱⁱⁱ In Iraq, what had begun with ISIS using commercial drones just for surveillance in 2015 quickly evolved into weapons^{iv}. ISIS then armed these drones with grenades and began widespread use in 2016. This became the “first” use of “armed drones against the US”^v. Even the recent fighting in Yemen has continued this use of cheap, commercial drones in combat as surveillance and attack mechanisms^{vi}. The Canadian Press agrees: Drones are now a part of modern warfare^{vii}.

It’s possible that many militaries, including our own, dismiss this use of commercial drones as just “toys” for lower technology militaries. The Donetsk conflict has shown this to be wrong, with both sides turning to commercial or austere-manufactured drones for extensive battlefield Intelligence, Surveillance, Target Acquisition, and Reconnaissance (ISTAR). With this being critical to the military decision-making process, the above conflicts have used any available means to gain an advantage in ISTAR. Overlooking this trend in very recent fighting would be complacent and put a fighting force at a significant disadvantage in a skill that can take some time to develop. So why is the use of drones so limited across the Canadian Forces? Let’s first look at small drones in other militaries.

STATE OF SMALL DRONES IN OTHER MILITARIES

United States

The 2020 US Department of Defense (DoD) budget allocates 0.4% for unmanned systems. That works out to be \$3.7 billion^{viii} or about 15% of Canada's entire defence budget! Let's return to these budget numbers later.

With these deep pockets, all branches of the US military deploy some form of drone. For small "Group 1" drones, the US is estimated to operate over 5700 vehicles^{ix}. However, what is relevant to this discussion is the widespread use of Chinese-made "DJI" brand drones for special operations which have come under fire in Washington for security risks. This use demonstrates that even with the considerable budget and technological capability of the US DoD, some elements are still, today, turning to inexpensive, off-the-shelf, commercial drones for important military operations^x!

Russia

In the past decade Russia has come a long way in developing its drone arsenal^{xi}. Though still lagging behind the US, the Russian military has significant armed and unarmed drone experience from the Ukraine and Syrian conflicts, now learning to use imported components to develop and assemble their drones. Reports are that even today, Russian is launching multiple drones a day in the Donbass^{xii}.

Finland

For a country of just 5 million people, Finland's military has a very active drone program. They have recently acquired 150 DJI phantom off-the-shelf drones as well as calling out to civilian drone pilots to potentially recruit for a "drone reserve" unit^{xiii}. The Finns appear to be adopting a very fast path to use of small commercial drones and generation of remote piloting capability, likely as a result of proximity to Russia.

Australia

Last year, Australia did something similar to what is being proposed in this paper: deploy commercial, off-the-shelf drones across their Army in order to build drone awareness. Their announcement sparked immediate interest from across their forces, with people contacting the Colonel in charge directly to "be the drone guy in their regiment"^{xiv}. This example is the closest to what is proposed in this paper – in fact, the CAF should more closely examine the Australian program and understand its impact and results in order to improve our own deployment of commercial drones proposed in this paper.

MILITARY APPLICATIONS FOR CURRENT SMALL COMMERCIAL DRONES

Civilian use of drones is exceeding expectations.^{xv} Though most of the growth is with hobbyists, continued advances in battery and sensor technology have kicked off and continue to fuel new developments in autonomous and remote piloted commercial applications. Let's look at what small commercial drones are doing today and how they relate to military tasks:

Supply Delivery. Amazon^{xvi} and even Uber^{xvii} are testing drone delivery of meals and goods to their residential customers today. Airspace regulators in a few countries are allowing limited trial of these technologies BEYOND VLOS. However, even "semi-autonomous" operation within VLOS could have military applications: such systems could easily be adapted to move a small amount of critically needed supplies from one Combat Service Support (CSS) echelon to another much quicker than by ground.

For example, recent Federal Aviation Administration (FAA)-approved commercial operations support urgent civilian medical supply delivery via drone. Imagine if you could quickly ferry, without further risk to lives, life-saving medical supplies from Role 3 to Role 2 medical facilities or directly to soldiers on the front lines?

Inspection, Survey, Surveillance. Our TV shows and movies have many more aerial shots than they used to as film crews no longer have to rent expensive helicopters to get overhead shots – they use quadcopters with stabilized camera gimbals^{xviii}. Camera, sensor, and recording technology has miniaturized considerably to make this possible. Drones are also increasingly used in precision geospatial survey as well as law enforcement surveillance. Payloads can include precision Global Position System (GPS) sensors, Light Detection and Ranging (LIDAR) sensors, and thermal cameras to help with detailed measurement of land or identification and tracking of targets. Construction companies also use these drones to inspect project progress or conduct infrastructure inspection. This is the largest use of small commercial drones today and there are obvious links to military applications in both training and combat environments.

All these applications require skilled, human pilots operating in VLOS. In the civilian world, demand for these types of pilots is growing annually^{xix}. This means there is a secondary benefit here to future soldiers and to the Canadian economy of a stream of highly trained remote pilots transitioning to civilian employment after military life. There may even be a possibility of army-trained remote pilots and crew supplementing shortfalls in the Air Force^{xx}! The training plan proposed below also ensures easy transfer of accreditation to the civilian world.

HOW CAN THE CAF CATCH UP?

If the CAF followed the US DoD spend of 0.4% on unmanned systems, there would be budget of about \$100 million. What is proposed here is using just a tiny fraction of this hypothetical allocation to enable widespread “drone literacy” in the CAF.

The three, viable options below require a new “rapid” method of procurement and deployment of commercial equipment in the CAF with minimal evaluation. These options also assume approximately \$1500 per off-the-shelf system.

Option A:

Outfit every unit in the Canadian Army with one small commercial drone system at a cost of approximately \$500,000 in hardware.

Though this would give every trade and unit an opportunity to gain remote piloting skills, it could be a very large challenge logistically and also for technical service/support. There is a very high probability of misuse of these systems, making this the riskiest option.

Option B:

Outfit only Artillery Regiments with small one commercial drone system at a cost of approximately \$50,000 in hardware.

While this may seem lowest cost, it also risks being least effective as learning curves may be steep, and units may struggle to share the skill among many interested soldiers with only one system. It also is

risky for redundancy as the loss of a drone means a significant setback in the overall development of remote piloting in our military.

Option C:

Outfit all Regular and Reserve Artillery Regiments with three small commercial drones systems and one full set of repair parts at a cost of approximately \$200,000 in hardware. Put another way, it is approximately \$5000 per regiment!

Artillery Regiments make sense as a smaller “test” of this style of skill development as small commercial drones can integrate well with other Artillery Battle Tasks:

- a. Gun Area Recce. The small drones can be an optional tool for recce. Even with a very modest 12km range an entire grid square Artillery Manoeuvre Area (AMA) could be overflown THREE TIMES from the edge of the square. Most drones would complete this in a single, 20-30 minute mission, providing a record of the mission and updated (ISTAR) to be sent higher.
- b. Forward Observation (FOO). Air OP-like drills could be conducted using a small drone instead of having to request an aircraft. This would significantly reduce risk to FOO teams as it enables them to be located away from the front lines or remain with the supported arms commander while still having “eyes” on the target zone for much less resources than current SUAS.
- c. Light Urban Search and Rescue (LUSAR). This is the hidden bonus/benefit. Reserve units, now tasked with LUSAR, would gain a force multiplier with a small drone fleet at their disposal. For example, the drone crews could conduct rapid damage assessments faster and with less risk to soldiers. Of course search and rescue would benefit in two ways – survey of difficult to reach places and, if properly equipped, delivery of life-saving supplies to those same difficult to reach places just as civilian SAR crews are doing today.
- d. Support to Other Arms and Civil Powers. Once established as a rapidly-deployable aerial surveillance resource, the Artillery would become valuable in many combat and non-combat operations.

Option C is still only a modest investment, while also providing enough hardware for the most suitable soldiers to develop a core competency in remote piloting.

WHY GUNNERS MAKE GREAT REMOTE PILOTS

Canadian Gunnery are already employed today as remote pilots, but let me reinforce why even Reserve Artillery Soldiers will make great remote pilots:

- **Knowledge of airspace control and conflicts.** Many Reserve gunnery officers and NCOs already possess these skills and will be able to easily interact with any air traffic control or airspace coordination centre in the Area of Operations (AO). This includes knowledge of time-based coordination, altitude (above ground level) ceilings, and various fire support coordination lines. For those that don't have this knowledge, drone training would make them aware of airspace coordination and serve as a first step towards further developing skills in this area.

- **Operation of electronics and communications equipment.** Artillery Reserve gunners today already operate as much or more technical equipment than other combat arms trades. The skill required here is not only the ability to adapt to new technology, but also to maintain it and troubleshoot it when things go wrong. Reserve gunners would excel at adopting drones into their repertoire.
- **Maps and target location in a land combat environment.** A drone crew must know where they are, where their targets are, and how best to plan a successful aerial mission. They must also be aware of cover and concealment as they are a scarce resource. These are skills already entrenched in Artillery FOO parties.
- **Meteorology.** Here is another skill that pilots must possess and gunners have an awareness of. Though absolutely unable to fly in very foul weather, moderate winds and visibility might not hinder a crew already experienced doing recce, radios, and fire missions in these conditions.

Our Army Reserve gunners share many of the above skills with their Regular Force counterparts who are already being trained in SUAS operations. But how difficult will it be to train Reservists in flight operations?

HOW TO TRAIN GUNNERS AS REMOTE PILOTS

I propose the best way to train our new remote pilots and crew is to send them through the already existing Transport Canada Advanced drone pilot certification program. This well-developed certification first starts with a “ground school” leading to a fairly comprehensive knowledge test. The material here includes theory of flight, meteorology, civil aviation regulations, radiotelephony, and remote piloting-specific rules. Transport Canada then requires an evaluation by flight review.

The Artillery Reserve version of this course, including additional Artillery-specific material, could be run in about six training days.

EVEN DRONES HAVE CONSTRAINTS

Leaving aside procurement issues for a separate discussion, the main challenge facing Artillery Soldiers becoming drone crew would be training – both training time, recency requirements, and other tasks.

Our Primary Reserve Artillery Regiments already have busy schedules and a long list of tasks. Would adding drones to this list put them over the top? On the contrary, I believe it could boost interest in the Artillery and attract more applicants. In the Primary Reserve, the drones would be a welcome platform to aid in all existing tasks and bring new attention to the Artillery. In fact, not needing to go to a training area to fly is a huge benefit and increases the flexibility of drone crew training.

Our harsh Canadian winters will also limit drone training to milder conditions – batteries have notoriously short runtime in below freezing temperatures and high winds, rain, fog all hinder any flight operations. This should not dissuade the Canadian Army from developing drone awareness and remote piloting as computer-assisted flight capability of drones are improving every year.

Security of drones has also been a hot topic in civilian and military worlds, particularly since the most capable commercial drones come from a supplier with links to the Chinese military – DJI. However, the company has promised to produce a “government” version and so have their competition. More secure drones are on their way.

LONG TERM

What is proposed here is simply a short-term injection of small drones into our military in order to build awareness of drones, and also start to develop remote piloting skills. As pieces of technology, this injection would eventually become obsolete, so regular, planned replacements must occur. At current rates of technological development, I recommend platforms have a maximum eight-year life.

CONCLUSION

There are no longer any excuses to continue to drag our feet on small drones as the benefits are many. For what is just a speed bump in our enormous defense procurement highway we can outfit every Regular and Reserve Artillery unit with small drones. Training material already exists thanks to our colleagues at Transport Canada. Artillery Reserve units can and must also use these small drones for LUSAR – becoming an invaluable “eye in the sky”. Like our weapons, vehicles, and other systems, the drones themselves can become a recruiting magnet. Lastly, remote piloting skills now have real world applications such that the job skills generated, and their overall economic benefit, should be a real consideration.

One doesn’t need a detailed cost/benefit analysis to see the overwhelming advantages of an inexpensive deployment of commercially-available small drones across the Canadian Artillery. What’s needed is the right people in our organization to agree and take action. This article hopes to have sparked that before the entire CAF falls too far behind.

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