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## RISE OF THE DRONES: CANADA'S EMERGING AIR DEFENSE THREAT

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# **RISE OF THE DRONES: CANADA'S EMERGING AIR DEFENSE THREAT**

## **AIM**

1. Canada does not currently possess a tactical Ground Based Air Defence (GBAD) system to counter air threats to any deployed Canadian Armed Forces (CAF) soldier and their equipment, whether on expeditionary or domestic operations, in support of the Government of Canada's (GoC) strategic goals. Understanding that the current capability gap is too wide to be filled by one single project, this service paper aims to argue that currently, the CAF's biggest vulnerability is the emergence of Unmanned Aerial Systems (UAS) in the current and future global security environment.

## **INTRODUCTION**

2. Air threats have been ever-present on the battlefield since the early 20<sup>th</sup> century. From the devastating effects of Stuka Bombers in the early years of World War 2 (WW2) by the German Luftwaffe in close support of their ground forces to the more recent accounts of drone swarms attacking Saudi Oil fields in the Persian Gulf.<sup>1 2</sup> The need has never been greater for modern armies to reform or revive their GBAD systems to counter the emerging threats of hostile UAS operations.

3. As he has repeatedly highlighted since becoming the Commander of the Canadian Army (CCA) in 2019, Lieutenant-General W.D. Eyre has overtly stated that the emerging air threat posed by UAS to the Canadian Army (CA) is becoming increasingly concerning with many

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<sup>1</sup> Frantzman, F.J. "Are air defense systems ready to confront drone swarms?" Defense News. Last accessed 07 Feb 2021.

<sup>2</sup> Burns, R. "Saudis couldn't stop attack on oil facilities, even with top US defenses." Military Times. Last accessed 07 Feb 2021.

examples highlighting the devastating results of such threats in recent conflicts "It is a capability shortfall right now. And as you see the emerging threats out there, it is one that concerns me."<sup>3</sup> Additionally, he continued by saying that Canada's soldiers need to be prepared for, especially "the swarming tactics of unmanned aerial vehicles."<sup>4</sup> Within the Canadian Army (CA), there needs to be an astute understanding of emerging technologies being used in UAS capabilities and their operations and how the current capability gap has created an increasingly concerning vulnerability to the effectiveness of the CA's Combat Power. This paper will initially highlight the vulnerability created by the divestment of GBAD capabilities within the CA. Secondly; the emerging threat of adversarial UAS in warfare will be discussed. Finally, the paper will make recommendations on the course of action required for the CA to counter the increasingly diverse air threat that includes the various unmanned aerial systems supporting future pan domain conflicts.

## **DISCUSSION**

4. Ground-Based Air Defense (GBAD) was considered a critical conventional allied capability in countering the Soviet threat during the Cold War yet the post-Cold War era and the fluctuating security environment of the 90s and the early 2000s seemingly had a detrimental effect on many of the allies' GBAD capabilities. The relative ease of achieving and maintaining air supremacy in the first Gulf War in Iraq by the U.S. led coalition was indicative of the uncontested airspace that coalition militaries would expect henceforth. Air superiority was expected to be achieved with relative ease in every conflict regardless of whether they were

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<sup>3</sup> Canada. Department of National Defence. Strong Secure Engaged: Canada's Defence Policy. Ottawa: Canada Communications Group, 2017.

<sup>4</sup> Ibid.

against near peer armies as was demonstrated in either Gulf Wars or the counter insurgency operations that were fought during the same period. Canada was not immune to the allure of having unobstructed aerial operations for conducting its expeditionary operations. The GoC, though not alone in underestimating future air threats, saw the coalition's technological and numerical air superiority in addition to the changing nature of warfare in the 21<sup>st</sup> Century as an opportunity to implement reforms to the Force structure of the CAF. The decrease in defense spending partly resulted in the neglect and degradation of a once deemed essential capability within the CA. The divestment of the CA's GBAD equipment (ADATs, 35mm twin cannons, Javelin) resulted in the eventual complete fratricide of a critical tactical shield function. This capability gap was often overlooked by the fact that the CAF was dedicated to a decade long ground war in Afghanistan, a conflict that offered a negligible air threat to the deployed CAF members. The risk of air attacks on Canadian soldiers was further mitigated primarily by two factors: the deployment of its troops within a coalition that still possessed a GBAD capability and the relative infancy of the adversarial UAS threat worldwide.

5. In 2017, the GoC made it abundantly clear that to have an effective war-fighting land force required a significant investment into a GBAD system. Canada's Defence Policy: *Strong, Secure, Engaged* (SSE) communicated coherently to the CAF that the gap created from the previously divested equipment was a risk that the GoC is no longer willing to accept. Meanwhile committing to an investment plan with a current funding range of 250-499 million CAD to acquire a GBAD system and associated munitions to counter the future air threats to the CAF.<sup>5</sup>

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<sup>5</sup> Canada. Department of National Defence. *Strong Secure Engaged: Canada's Defence Policy*. Ottawa: Canada Communications Group, 2017.

6. Although the use of balloons, the earliest version of an unmanned aerial system, for military purposes can be found dating as far back as the late 1800s.<sup>6</sup> The use of the modern day UAS by the UK and U.S. militaries dates back to the 1930s when both militaries experimented with the use of radio controlled unmanned aircraft to act as targets for realistic Anti-Air (AA) gunnery training.<sup>7</sup> The potential of these unmanned systems became apparent and many nation states began research into developing their own drones. As previously mentioned, the versatility of its role and the new technology has exponentially increased since its inception; however, the start of the U.S. War on Terror is where many of today's technological advances originated.

7. The rise of the drone and drone warfare has seen many significant innovations and the capability has emerged as one of the most important military system in use on the modern battlefield.<sup>8</sup> From their extensive use in the War on Terror to their expanded role within a conventional context, its emergence as a critical warfighting capability has been established and its current capabilities seem to be the precursor of a greater more capable role for the UAS. As UAS technology continues to advance at a rapid rate so too does the evolution of its future role. Current research into the development of more capable autonomy and the introduction of artificial intelligence will increase the effectiveness and potential for greater lethality of future systems.

8. While recent conflicts against failed or failing states have created a false sense of security from air threats to allied land forces, one trend that is emerging from these conflicts is the

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<sup>6</sup> Imperial War Museum. "A Brief History of Drones." Last Accessed 07 Feb 2021.

<sup>7</sup> Ibid.

<sup>8</sup> Herzog, R. "Rise of the Drones: Drone technology spans a century's worth of science fiction and military research." Lapham's Quarterly, Last accessed 07 Feb 2021.

increased overall use of both allied and adversarial unmanned systems in warfare. The use of these systems is shaping the future conflicts at an expeditious rate.

9. UAS technology is becoming more readily available, smarter, cheaper to acquire and easier to operate. This reality is of concern to any western military that sees itself conducting any type of Counter-Insurgency (COIN) operations in the future. An increasing number of non-state actors across the world have access to UAS capabilities and use them regularly to conduct standard tasks such as Intelligence, Surveillance and Reconnaissance (ISR) and more importantly kinetic attacks on their adversaries. More concerning is the relative ease that the terrorist groups are acquiring these systems and its giving them a significant air capability at a fraction of the price of their militarized counter parts. Whether their drones are “off the shelf” or acquired through proxies states, the relative low cost of drones when compared to a modern Air Force is significantly lower; however, as was witnessed in Yemen in 2015, the successful use of drones by the Houthi movement, Ansar Allah, against a much more sophisticated and larger Saudi Military is of significant value. The tactical importance of these attacks is indicated by the relative ease that the drones accomplished bypassing Saudi Air Defense systems, systems that were not meant to counter the threat of a UAS. Drones are achieving tactical success in attacking their intended targets, Aramco Oil refineries, located well beyond their political borders. Targets that Houthi missiles had previously attempted to attack but were unsuccessful in penetrating Saudi defenses.<sup>9</sup>

10. Conversely, the threat of UAS operations between two conventional forces has been recently witnessed between Russia and Ukraine with the Russian annexation of Crimea in 2014.

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<sup>9</sup> Muhsin, D. “Houthi use of drones delivers potent message in Yemen War.” International Institute for Strategic Studies. Last accessed 07 Feb 2021.



The armies of the West meticulously analyzed lessons learned from the tactics employed by the Russian military in their massive use of drones as artillery observers to call lethal barrages of indirect fires that decimated many Ukrainian targets. The use of UAS as an ISR platform is a common practice in modern militaries; however, the greatest cause for concern is Russia's "ability to combine multiple networked sensing platforms into a real time targeting system for massed, not precision, fire strikes."<sup>10</sup> A few key concerns arose from these observations. First, the speed at which the artillery barrage had come after the Ukrainian Forces spotted Russian drones and secondly the large amounts of layered UAS operating simultaneously over the Ukrainian positions.

11. Another relevant example of the devastation that drones can provide a nation state is the 2020 Nagorno –Karabakh conflict between the nations of Armenia and Azerbaijan over the disputed mountainous enclave. With Azerbaijan's superior economy it purchased a greater number of quality UAS from Turkey and Israel to support their war efforts. Although the use of a single capability like the UAS will not revolutionize the nature of warfare, its synchronization of new weapons have the potential to shorten the kill chain and provide greater lethality and destruction to its intended targets.<sup>11</sup> Although the lessons learned from this conflict did not provide observes with any new findings, it did however provide tangible examples of the effectiveness of cueing indirect fires with unmanned systems and more importantly the lethality of loitering munitions or "kamikaze drones" that decimated Armenian tactical targets

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<sup>10</sup> Phillip Karber. "'Lessons Learned' from the Russo-Ukrainian War." (Draft Document). The Potomac Foundation, 6 July 2015.

<sup>11</sup> Shaikh, S., Rumbaugh W. "The Air and Missile War in Nagorno-Karabakh: Lessons for the Future of Strike and Defense." Center for Strategic and International Studies. Last accessed 07 Feb 2021.

inadequately shielded from the Azerbaijan drone threat.<sup>12</sup> Overall, the conflict provided an insight into the devastating use of drones in a modern conflict and for many has been another insight into the future of drones in warfare.

12. Conventional military adversaries, countries like China, Iran, Russia and North Korea all have extensive UAS capabilities and many of them are actively pursuing the development of enhanced functions with the implementation of artificial intelligence to enable the system to conduct a wider array of simultaneous tasks at speeds that are severely restricted with the current human in the loop systems.

13. Canada should focus of the UAS threat primarily because many of our allies AD systems that are still in service were designed to counter fast moving targets that emit very large heat signatures like aircrafts or very fast moving projectiles with a ballistic trajectory (ie. Mortars, tube or rockets artillery, Ballistic missiles, etc). The CAF will continue mitigate the air threat by deploying its forces as part of a coalition that will allow some layered protection from adversarial air threats; however, as this paper demonstrated, even militaries with modern air defense systems are vulnerable to a wide array of kinetic and non-kinetic actions against their deployed forces. The previous examples of a drone's role in modern warfare is a grim reminder of the devastating potential that these systems have in shaping the battlefield. Ever-more concerning to security experts is the rate of advance and availability of technologies that the modern drones possess. Private sector technology races have far outstripped the capacity of the modern military research, development and procurement process and it has become unattainable for defense procurement to compete. The layered approach to AD is far from being a novel concept and will continue to be required as an effective means of protecting allied airspace;

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<sup>12</sup> Eckel, M. "Drone Wars: In Nagorno-Karabakh, The Future Of Warfare Is Now." Radio Liberty. Last accessed 07 Feb 2021.

however, with recent examples of relatively low cost UAS inflicting unimaginable destruction upon its adversary it causes much concern for the CAF's involvement in future conflicts without an adequate counter UAS capability.

## **CONCLUSION**

14. The nature of future conflicts and the challenges of the current security environment will continue to rapidly evolve, as they have both done over the past few decades. Current technological trends discussed within this paper will continue to threaten the expeditionary and domestic deployments of CAF personnel. The use of adversarial UAS will continue to challenge currently available counter measure and will gradually require the use of artificial intelligence to effectively detect, identify and defeat inherent air threats. Accessibility of advanced UAS technologies will continue the proliferation of adversarial UAS operations against Canadians. The few examples provided within this paper were used to demonstrate how the tactical use of UAS by adversarial state and non-state actors is becoming more prevalent in recent conflicts and is shaping the possible employment strategies in future conflicts. Without a proper organic tactical GBAD capability, the CAF will continue to exist in a vulnerable state to enemy air threats or be completely dependent on its allies to provide a robust shield function for future ground based expeditionary operations.

## **RECOMMENDATIONS**

15. Acquire a tactical GBAD system that is integrated and networked through a CAF Command, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4SIR) spine while being interoperable with other CAF elements and its allies. The system is required to be modular and capable of countering the increasing complexity of UAS threats to Land Forces. Two major categories of Counter UAS technologies must be adopted within the CAF. Both kinetic and electronic categories of counter measures are required to provide a redundant system to counter UAS operations. Layered approach to aerial defense will be crucial to defeating UAS threats (defending against platforms and attacking the networks).

16. The CAF must continue to revise its current doctrine and update modern air defense principles as well as expanding the current literature to include establishing a relevant and effective approach to countering UAS air threats. Individual Training (IT) and Collective Training (CT) must continue to incorporate AD doctrine to include the emerging air threat from unmanned and autonomous systems as well as provide soldiers with complex realistic problems arising from adversarial UAS operations during training.

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